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AUTOMOTIVE INDUSTRIES

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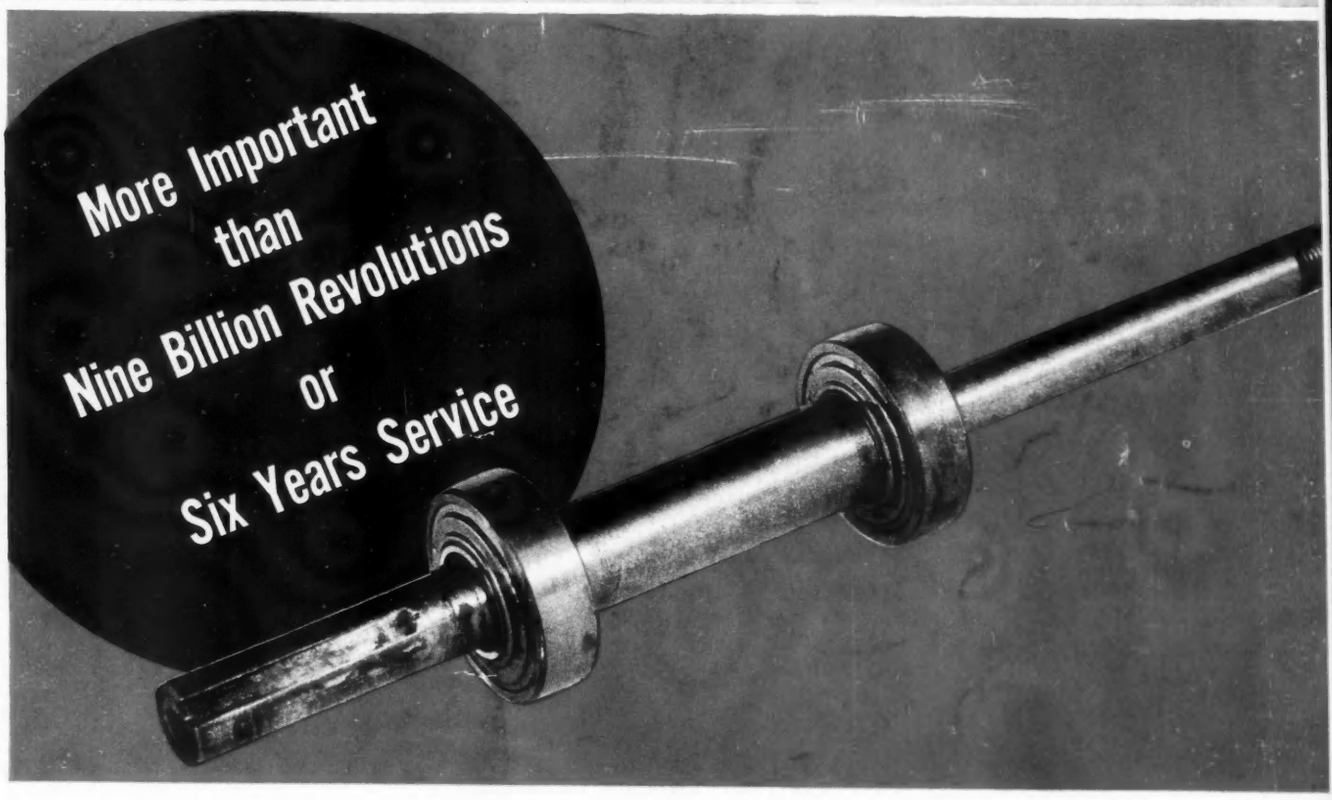

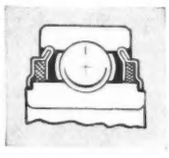

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Published Semi-Monthly

Volume 83 Number 5

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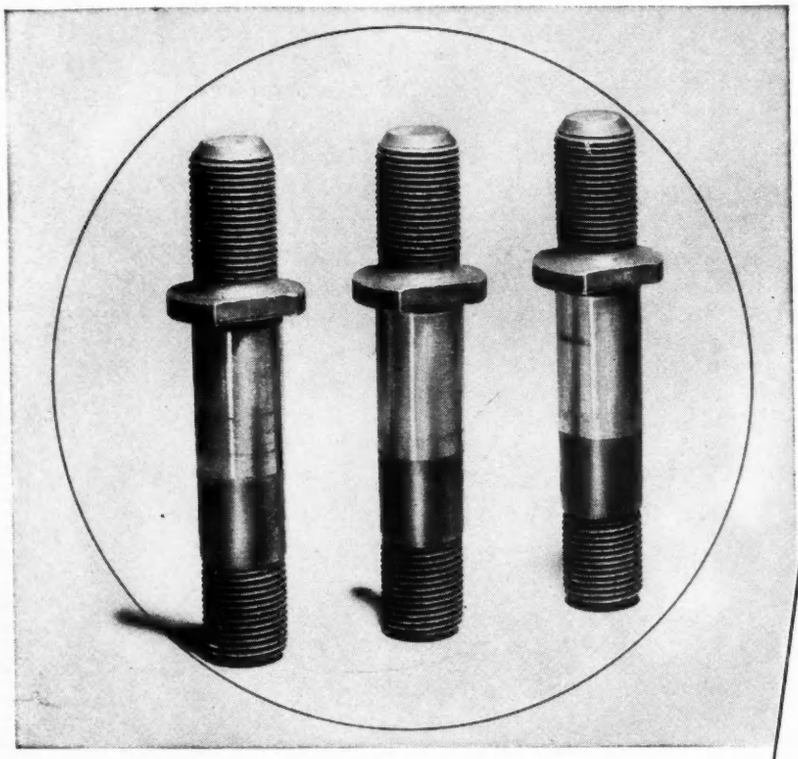
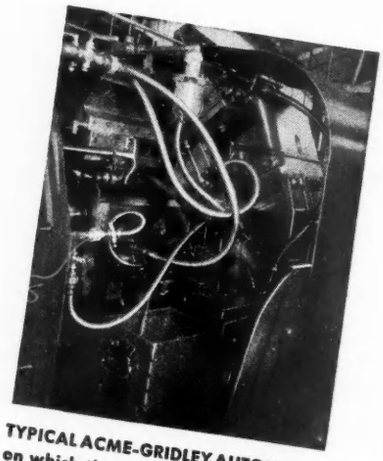
Machining
DISC WHEEL STUDS
—in Less Time—at Less Cost



(Left) **TYPICAL DISC WHEEL** studs of SAE 3140 steel, produced in less time and at less cost, with *Texaco Sultex Cutting Oil.*



TYPICAL ACME-GRIDLEY AUTOMATIC on which the disc wheel studs shown opposite were machined at such savings in time, tool life, cost . . . using Texaco Sultex Cutting Oil.

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Machining time per stud has been shortened from 140 to 122 seconds. These improvements are direct results of changing over to *TEXACO SULTEX CUTTING OIL B.*

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TEXACO SULTEX
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IN THIS ISSUE . . . .

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Volume 83 September 1, 1940 Number 5

Mileage Marathon Each year at their annual picnic the engineers of the Shell Oil Company's Research Laboratory have a lot of fun with a contest which they call the Mileage Marathon. Last year R. J. Greenshields succeeded in covering a distance of 27 mi. in a '33 Plymouth with 2055 c.c. of regular grade fuel, thus averaging 49.7 m.p.g. with an engine of 201.3 cu. in. displacement. Some of the tricks used to obtain this phenomenal mileage were rather ingenious. The well-known fact that an engine in a warmed-up condition gives the best mileage was utilized by shielding the radiator, crankcase, and transmission and employing an exhaust heater on the differential. Rolling friction was reduced by inflating the tires to 50 lb. pressure. Radiator fan, water pump and generator were disconnected to conserve the horsepower required to operate these auxiliaries. Distributor and carburetor were adjusted to optimum settings of spark timing and air-fuel ratio.

In the first mileage marathon held in 1939, some 20 persons from the laboratory took part, driving their personal cars and averaging, as a group, 29 m.p.g. A closed route of 14.1 mi. was specified for the race and each entry was given an allotted amount of gasoline according to the weight of his car. Using information from a number of technical papers and data obtained in their laboratory tests, the engineers formulated the following equation to determine the quantity of gasoline to be proportioned for a car of given weight which would be sufficient to bring the contestants around the 14.1 mi. course and back to the starting point:

$$Q = \frac{\text{Dist.} \times cc./\text{gal.} \times \text{lb.Bhp. hr.} \times (CW + KAS^2)}{M \times E \times \text{lb./gal.} \times 375}$$

Where the Distance is 14.1 miles, the specific fuel consumption of the engine is assumed to be 1.0 lb./Bhp. hr., the rolling friction constant, C, is taken as 0.014 lb./lb. of load.

W is the weight of the car in pounds.

The wind resistance coefficient, K, is taken as 0.001.

The frontal area of the car, A, is assumed to 23.5 sq. ft.

The speed, S, is assumed to be 20 m.p.h.

M is a coefficient inserted to correct for the fact that mileage is improved by clever driving. A value of 114 per cent was used.

E, the overall mechanical efficiency of the chassis, is taken as 67 per cent.

The constant, 375, is required in changing miles per hour to feet per minute and dividing by the number of ft.-lb. per hr. in one horsepower.

This year the men competed in a similar contest and the record of 55.7 m.p.g. was obtained in a Ford V8 of 221 cu. in. displacement. The distance covered on 2115 c.c. of gasoline to win was 31.1 mi. The average for the entire group of 20 cars was 37 m.p.g. F. B. Baggerman, although using some of the means already mentioned to reduce rolling friction and increase the economy of his engine, introduced a new technique. Realizing that minimum specific fuel consumption of an automotive engine is at intermediate speed and nearly full load, Mr. Baggerman accelerated from 16 to 37 m.p.h. at full throttle and then with the ignition off coasted down to 16 m.p.h. before repeated the cycle; thus the engine was operating at nearly minimum specific fuel consumption all of the time it was running. The car speed of 16 to 37 m.p.h. was a judicious compromise between the engine speed for greatest economy and the power used in overcoming wind resistance at high car speed.

Already the engineers are looking forward to the marathon of 1941. It is planned to broaden the contest and allow fuels of any desired composition to be used in the race.

GENERAL — Page

Detroit's Defense Orders 189

There are between $200,000,000 and $300,000,000 in national defense contracts in the Detroit area. Many repercussions are sure to come out of the situation. In this article Edward L. Warner, Jr., makes a survey of the situation as it is today and adds some worthwhile quotes from those in the "know."

PRODUCTION

Sealed Power Facilities Bring Precision 192

A trip through the Sealed Power Plants by Joseph Geschelin brings forth some interesting production techniques. In his usual thorough style he takes you on the trip from "stem to stern."

NEW CARS

New Body Styling On Hudsons 212

The Hudson plant has gone in for quite some innovations in their styling for the 1941 season.

Studebaker Makes 1941 Bow 214

Several new features in the mechanical design of the new Studebakers as well as body refinements are offered in the new lines.

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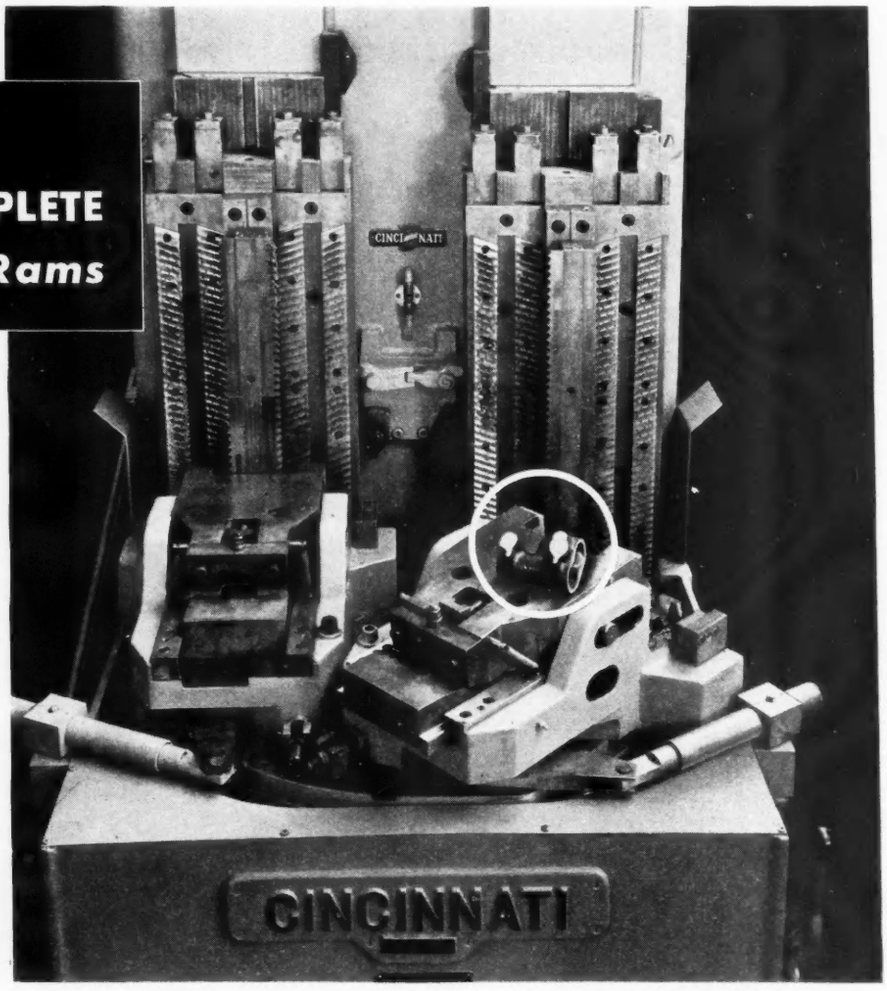
TWO CASTINGS BROACHED COMPLETE *Each Stroke of Rams*



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In many cases, two or more similar parts, such as these right and left hand shock absorber bodies, can be broached together at an exceptionally low unit cost. The equipment selected for the job—a CINCINNATI No. 5-54 Duplex Vertical Hydro-Broach Machine equipped with two fixtures, each holding one pair of parts—fulfills the low cost requirement of the job with room to spare.

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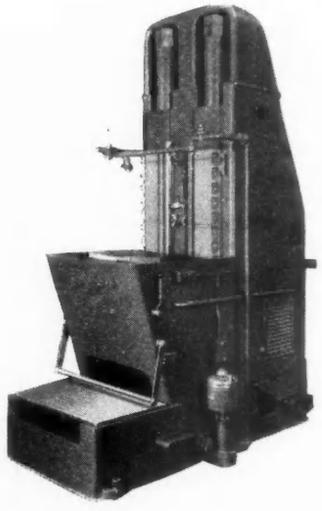

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AUTOMOTIVE INDUSTRIES

Published on the 1st and 15th of the month

Vol. 83, No. 5
September 1, 1940

Detroit's Defense Orders . . . .

By EDWARD L. WARNER, JR.

ALTHOUGH Detroit and Michigan manufacturers have been awarded an estimated $200,000,000* in national defense contracts, there seems to be no shortage of productive capacity in the area to fill these Government orders. A few plant additions are under way or on the drafting boards of construction companies, notably the $20,000,000 tank factory which Chrysler Corp. will build for the Government on the outskirts of Detroit. But most companies so far have been able to fill defense orders in the normal routine of production, although employment has been stepped up in some cases.

Typical . . .

The Packard aircraft program will require 14,000 workers when it gets into production, of which Packard has only 5,000 on its reserve labor list. The Chrysler tank project will employ 4000 or 5000 more. The same manufacturers report plants from other cities enticing skilled workers away with lucrative offers.

In the U. S. Army's mechanization program, Chevrolet, Chrysler and Yellow Truck & Coach have received the bulk of the orders for putting the Army on wheels. The latest order calls for 29,356 vehicles costing $28,493,229 from these three manufacturers. These orders could be filled within 10 weeks' production time in addition to the plant's normal output for regular commercial customers. Either General Motors or Chrysler has sufficient productive capacity in the truck field to turn out enough vehicles to supply the Army's needs in a year.

Detroit industry appears well satisfied with its share of the national defense activity to date. The system of sealed bids seems to be working out well and Michigan manufacturers feel they are getting a substantial share of the business. Government specifications and attendant red tape have caused some confusion in certain instances but these are being smoothed out as the program gets under way.

Chief tie-up has been in the Packard Motor Car Co. order for 9000 Rolls-Royce Merlin aircraft engines. The question of cutting the amortization period on the plant expansion necessary from 10 to five years has been before Congress and there also is the question of an RFC loan to help finance the $30,000,000 plant expansion. Some technical details remain to be ironed out, on which the Packard engineers and drafting force are now at work. Adapting the English Rolls-Royce motor to U. S. production methods is one of the problems being worked out. A new test house for motors is among the plant additions to be made. In contrast to most defense orders, Packard's aircraft activity will almost overshadow its motor car production, employing 14,000 workers compared to 10,000 in the automotive division. Packard also has completed a $2,000,000 order for 81 marine engines for the U. S. Navy's mosquito fleet.

Ford Motor Co. has agreed to manufacture 4000 Pratt & Whitney radial air-cooled aircraft engines. These probably will be turned out in space available at the Rouge River plant. Ford has had 300 draftsmen and engineers working on aircraft plans for several months. Henry Ford has stated that his organization is ready to do anything it can to aid the national defense program, but he refused the Rolls-Royce engine order, which then went to Packard, because 6000 of the motors were destined for England. On his 77th birthday, Ford revealed plans for a 12-cylinder liquid-cooled valve-in-head motor with a light alloy block, an engine of the Zephyr type, which the company will soon be prepared to produce in quantity.

The Chrysler Corp. order for $33,500,000 for 4000 Army tanks is the largest received so far in the Detroit area. This will require a $20,000,000 plant having an estimated 800,000 sq. ft. of floor area and employing 4000 or 5000 men. Production is expected by the fall of 1941. Chrysler also has educational orders for fuses, bomb noses, cartridge cases and the machining of 75-mm. shells.

In addition to Chevrolet trucks, General Motors' defense orders in Michigan include one for $725,004 to the Saginaw Steering Gear Division for Browning machine guns.

Other large Michigan defense orders include Budd Wheel Co., Detroit, $5,882,504 for shells and ammunition; Continental Motors Corp., Muskegon, $3,875,850

* Detroit estimates range from this to $300,000,000 by the Detroit Board of Commerce. Exact figures are not available from Washington because details of some orders are kept secret and others, like Ford on P & W aircraft motors, are sub-contracts from other suppliers.

for tank and aircraft engines; Vickers, Inc., Detroit, $1,942,838 for gun turret equipment and pumps; Timken-Detroit Axle Co., Detroit, $779,710 for guns and equipment; Saginaw Stamping & Tool Co., Saginaw, $328,221 for gun carriages; Hayes Industries, Inc., Jackson, $227,737 for airplane wheel and brake assemblies; Bohn Aluminum & Brass Corp., Detroit, $239,970 for metal parts for boosters and aluminum.

Most of these companies are using existing plant facilities, although Vickers expanded its plant last spring and Timken-Detroit Axle, with a peak payroll of 5000 men, is planning a small addition. Budd Wheel and Continental Motors both have ample space available in their present plants for their national defense orders.

Some confusion has been caused by national defense bidders placing orders for machine tools in anticipation of landing a Government job, then cancelling when it went to another bidder. This has caused a duplication of orders at the machine tool builders and a false demand.

The labor situation in Detroit at present is more stable than it has been in the last five years, with the unions displaying a new responsibility, especially since the signing of the General Motors Contract. The unions also have shown eagerness to cooperate in every way with the national defense program.

There is some difference of opinion as to any possible labor shortage when the national defense program really gets under way in Detroit. A spokesman for the manufacturers anticipates a shortage of skilled workers due to the static nature of the apprenticeship program under union regulation. He pointed out that the ratio of one apprentice to every 20 workers probably should be cut to one for every 10 workers. He believed that more apprentices are needed in the factories and more training necessary in the primary skills through vocational classes.

The Packard aircraft program will require 14,000 workers when it gets into production, of which Packard has only 5000 on its reserve labor list. The Chrysler tank project will employ 4000 or 5000 more. Then some manufacturers report plants from other cities enticing skilled workers away with lucrative offers.

General Motors anticipates no shortage of skilled labor in its plants, according to the recent statement of Alfred P. Sloan, Jr., board chairman, who said, "Because of our long range training program built up over the past 21 years and designed to meet any need that might arise, General Motors has a goodly supply of trained personnel and also the facilities to expand as circumstances require." GM officials feel that the flexible training program that stems from General Motors Institute and reaches down into the shops puts the corporation in a very favorable position for providing manpower for defense production.

Walter Reuther, director of the GM Department of the UAW-CIO, gives labor's viewpoint on the national defense outlook. He asserted the UAW is willing to give its fullest cooperation in furthering the national defense program and it will train the necessary apprentices if and when that is necessary. Reuther said there is no shortage of skilled or unskilled automotive labor at present. By Sept. 15, he said, there will be 4000 or 5000 skilled mechanics available, because the automobile retooling program will be completed by that time.

Reuther stated that labor requirements would have to be worked out by negotiation between labor and management when the need arises. First, they must determine how many workers are needed. In filling these needs, the union will insist that all skilled mechanics available be employed before breaking in new men; that seniority be protected and that established standards of pay and hours be maintained.

In carrying through the national defense program, the leaders of the automotive industry have pointed out repeatedly that the normal production program must be carried out simultaneous with government orders in order to supply the U. S. with motor vehicles and to maintain a reasonable prosperity that will bear the taxes that national defense requires.

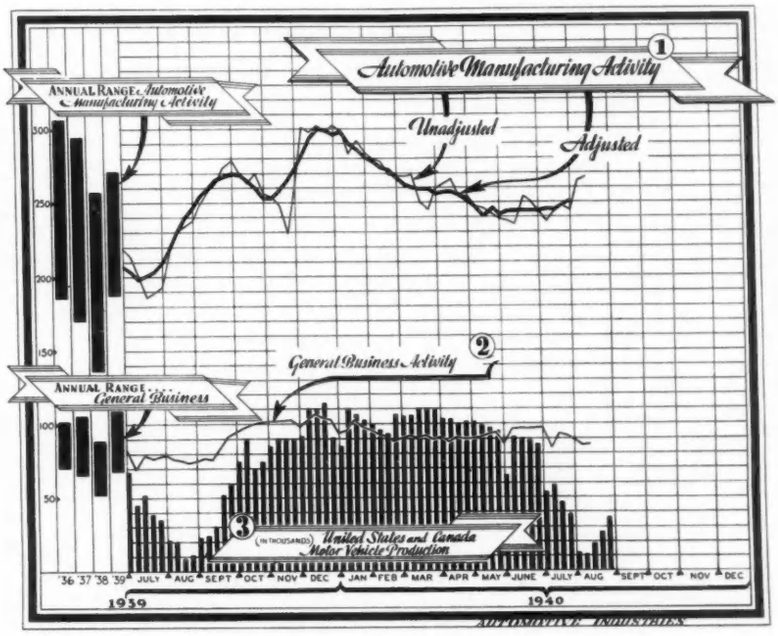
(*Turn to page* 233)

The Brass-Hat Rack

"The Old Man's been that way ever since the government asked him to switch over to tanks!"

BUSINESS IN BRIEF

Our own view of automotive production and sales; authoritative interpretation of general conditions



Weekly indexes of automotive general business charted

Production Swings Into 1941 Gait

PRODUCTION of motor cars and trucks began its seasonal climb in the latter part of August after reaching its lowest point of the year the first of the month. Output for August was estimated at 105,000 units, only slightly in excess of 103,343 vehicles turned out in August last year.

For the week ending Aug. 24, production was approximately 28,000 vehicles. General Motors accounted for 10,300 motor cars and trucks as Chevrolet and Oldsmobile resumed operations and Buick and Pontiac stepped up their manufacturing of 1941 models. Chrysler produced 5700 units, confined to 1941 Plymouth models and Dodge trucks, while Ford, just winding up retooling efforts, made only 1250 vehicles, mostly trucks.

Hudson led the independents, followed by Studebaker, Packard and Graham. The only manufacturers not yet in production on 1941 models were Cadillac, Chrysler, DeSoto, Mercury, Lincoln-Zephyr, Nash and Willys.

With manufacturing schedules accelerated and more plants beginning 1941 model operations, production was expected to jump to 40,500 units for the week ending Aug. 31. Several companies are completing the biggest August schedules on record. Buick's schedule was 16,000 cars, Pontiac set its goal at 11,735 and Hudson at 11,500.

July production, according to Department of Commerce reports, was 246,171 vehicles.

Retail sales continued to reach high levels, with July marking the twenty-first consecutive month in which sales have exceeded the same month of the previous year. July retail deliveries of 357,939 motor cars and trucks were 27.5 per cent above July, 1939, according to the Automobile Manufacturers Association. Passenger car sales in July were 298,618 units, up 29.9 per cent, while truck sales of 59,321 units showed an 18.6 per cent increase. Seven-month sales for the industry in the U. S. total 2,524,841 cars and trucks.

General Motors' retail deliveries during July increased 42 per cent over July, 1939, with sales of 145,064 vehicles. GM sales for the first seven months of 1940 are up 35 per cent. The summer sales boom was evident in Pontiac retail deliveries for the first 10 days of August, which totaled 4404 units, an increase of 51.5 per cent over the same period of 1939. Studebaker's July sales of 9001 units were the largest for that month since 1929.

July new car and truck registrations were estimated at 376,000 units by R. L. Polk & Co. on the basis of reports from 34 states.

Harlow H. Curtice, president of Buick, has set a goal of 300,000 car sales in the 1941 model year, while Harry J. Klingler, president of Pontiac, aims for 275,000 cars, a 30 per cent increase.

AUTOMOTIVE MANUFACTURING ACTIVITY picked up appreciably in the week ended Aug. 10, the unadjusted index charted herewith, advancing 20 points to 265. The unadjusted index continued to rise during the week following with 268 being marked up for the week ended Aug. 17. A swing upward likewise, is noted in the adjusted curve, for many weeks at about 244. During the weeks ended July 27 and Aug. 3, it passed through 247 and 251.

[1] 1923 average = 100; [2] Prepared by Administrative and Research Corp. New York. 1926 = 100; [3] Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

Sealed Power Facilities

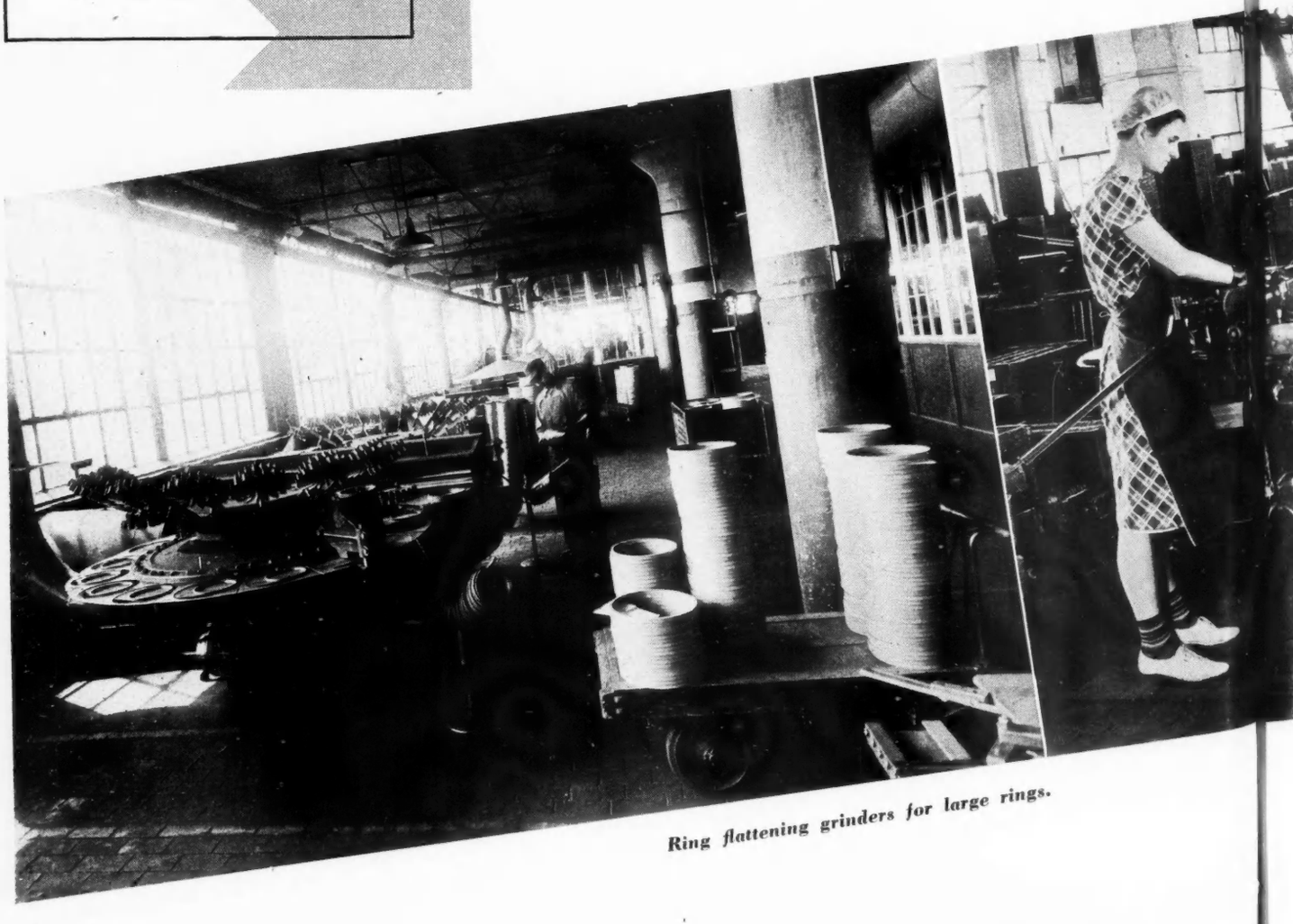
By JOSEPH GESCHELIN

PROMINENT among the top names in the piston ring business, the Sealed Power Corporation, Muskegon, Mich., traces its beginning to a day in the fall of 1911 when two pioneers—C. E. Johnson, the present president, and Paul R. Beardsley, the present secretary-treasurer—started The Piston Ring Company. The corporate name was changed to Sealed Power Corporation in 1932.

This is the Fifty-second in the series of monthly production features

From the beginning, Mr. Beardsley assumed the rôle of business manager, and Mr. Johnson, the responsibility of product development and manufacturing. The success of the company is a result of the diligence of these two men in their respective fields and their close cooperation through the years. Mr. Johnson's engineering ability and genius as an inventor has kept the company in a position of leadership in the contribution of new and advanced products to the industry. Mr. Johnson was one of the men recently selected by Dr. Karl T. Compton's National Modern Pioneer's Committee for a Modern Pioneer Award.

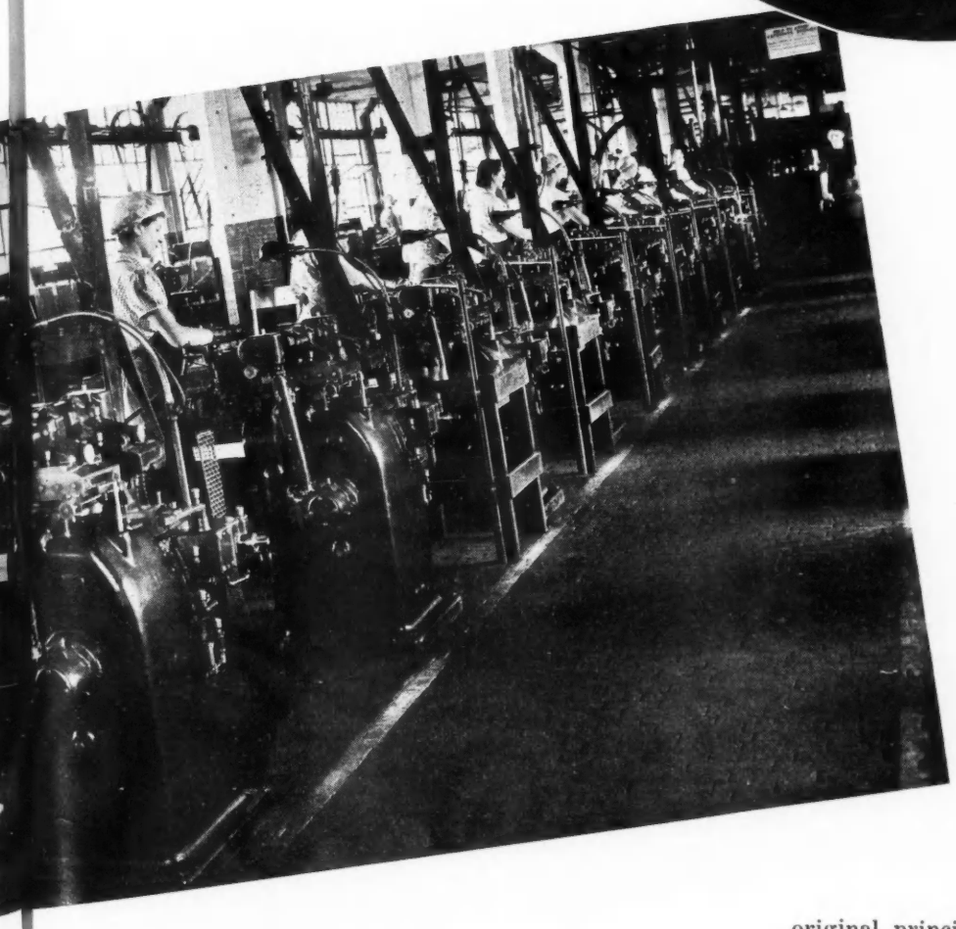
Although the company catered exclusively to the standard equipment business at the outset, it entered the replacement field in 1921 and today has an organization of well over 1000 distributors, supplied by 22 warehouses located in the principal cities of the United States, and one warehouse in Canada. A manu-



Ring flattening grinders for large rings.

Bring Precision

(Circle) Piston rings in a maze of sizes and types are a regular feature.



(Left) Automatic machines for milling out a segment to form the proper ring gap.

facturing plant was established in Windsor, Ontario, in 1936 to supply piston rings to Canadian manufacturers. Castings for this plant are made in the Muskegon Foundry, but are completely machined and processed in the Canadian plant. Facilities also are established for handling export trade to other foreign countries.

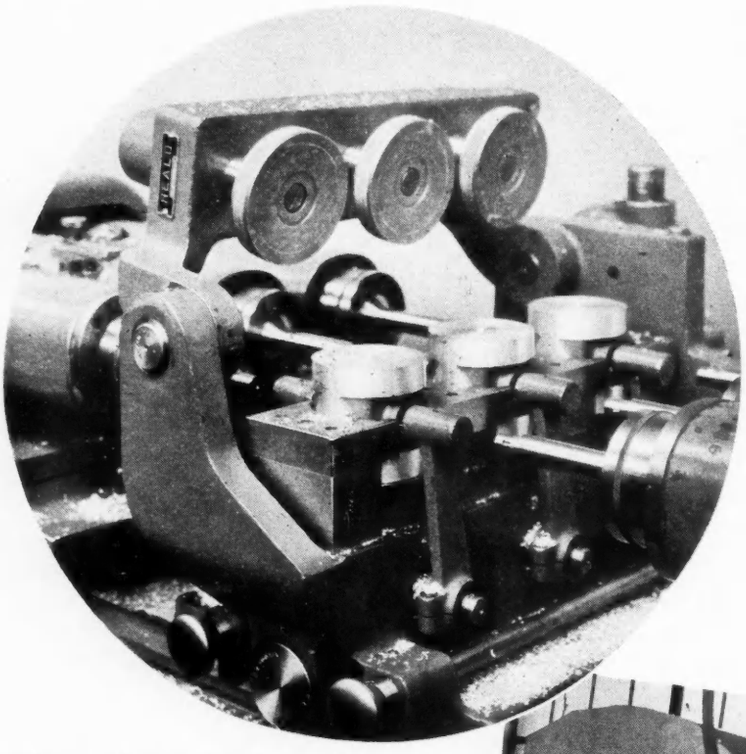
From its modest birth in 1911 with a plant of 1800 sq. ft. of floor space, the company has enjoyed an enviable growth in stature and acceptance, today is one of the largest producers of piston rings with a plant boasting 296,500 sq. ft. of productive floor space.

Currently, the company makes piston rings ranging from $\frac{5}{8}$ in. in diameter, the smallest size, to 64 in. in diameter for large industrial applications. In 1932, it acquired control of the Accuralite line, now a part of the present plant, thus adding pistons and cylinder sleeves and liners to the list of its products.

One of the most recent contributions to the art was the development of the Granoseal process for producing a wear-resistant chemical coating on the surface of replacement rings and on standard equipment rings where specified by the user.

Success of the Sealed Power piston ring is credited to the original principle of making individual out-of-round castings which produce an accurate circular form with suitable tension after machining. Like other major producers in this field, the company has unique engineering and tool shop facilities for the design and manufacture of special items of machinery and tooling required in piston ring production.

As evidence of advanced manufacturing practices, we point to the fact that the company is rated one of the oldest users of Carboloy, having made some early applications in 1929 when this material was in its infancy. Today Carboloy is employed on practically 100 per cent of metal cutting operations in this plant.



One of the two Heald Bore-Matics used for precision-boring wrist pin holes. Outstanding feature of the tooling is the use of hydraulic clamping and alignment in the fixture. It may be noted in this view how the three swinging arms have come in to line up the holes with respect to the spindles. At this point the operator presses another button which brings down the top clamping head, by means of a hydraulic mechanism, to hold the pistons firmly in position.

The foundry is divided into two separate sections: One for automotive rings, with a productivity of 35,000 ring castings per hour; the other for large rings ranging from 5 in. to 64 in. in diameter. In addition to its other features, the foundry has a large pattern storage where about 10,000 metal patterns are neatly housed in steel racks. Each pattern is carefully checked with precision gages and templates for size, shape, and accuracy before placing it in production.

The foundry building, consisting of a main floor and full basement, is so arranged that all coke, pig iron, limestone, molding sand and other raw materials used in the foundry are taken directly from the railroad cars and dropped into the basement storage.

From this storage the cupola charges are made up and taken to the charging floor with an electric freight elevator which also serves to move other foundry materials. Each metal charge is prepared with 50 per cent virgin iron; the remainder being made up of returns, sprues, etc., no outside scrap being used.

The foundry is served by three cupolas: One 56-in. diameter lined to 32 in. for large rings exclusively; and two 63-in. diameter units lined to 42 in. for automotive rings. The latter are run on alternate days to allow for lining repairs. A dehydrating system is employed to supply air to the cupolas

Corner of Final Inspection Department. Ring tension scale in foreground is a new Sealed Power development.

Foundry

Sealed Power is justly proud of the piston ring foundry which is completely mechanized with equipment designed by its own engineers and in many instances built in its own shop. Perhaps the most distinguishing feature of the foundry is the absence of dust and fumes and dirt so intimately associated with the usual operation of a large and busy establishment. This is attributed to the generous use of dust collectors and ventilating systems at the strategic points; also the frequent use of vacuum cleaning equipment.

of a constant moisture content, held to a fineness of two grains per cubic foot of air. Cupolas have a capacity of nine tons molten metal per hour or 72 tons of metal per day. An electric furnace is also included in the melting equipment, for making special heats for alloyed ring castings.

The entire melting operation is under constant control by the metallurgical laboratory. All of the raw materials are checked as received. The iron is poured at the exceptionally high temperature of 2850 deg. Fahr. and checked by a chill bar specimen test every 15 min. In addition, test rings are poured every hour, machined and tension-tested. As a further check, an hourly chemical analysis of test ring material is made.

All rings are cast individually. The molding is divided into two separate departments, one for automotive rings, the other for large rings. Automotive ring castings are produced on a self-contained rotary type mold conveying table, 90 ft. in diameter by 4 ft. in its cross section, around which are located 46 molding machines, 23 on the inside and 23 on the outside.

These molding machines were designed and built by the company to meet its special requirements. A complete ring mold is made up of 12 layers, $1\frac{3}{8}$ in. thick by 14 in. in diameter, which are stacked one on the other. Each layer contains from five to eight circular cavities, depending on ring diameter, connecting to a central sprue.

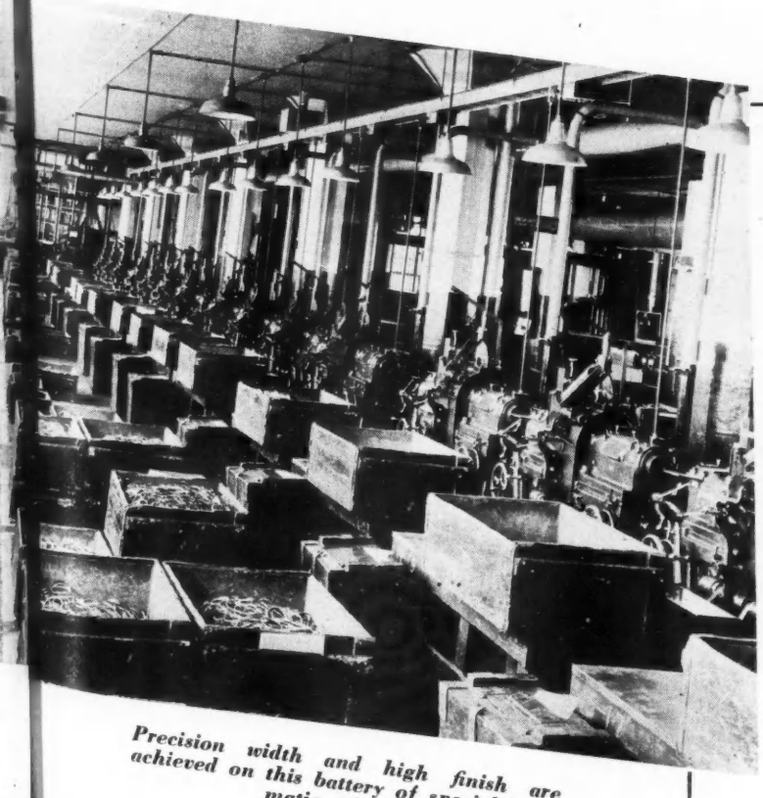
An interesting feature of this molding line is the use of flasks of various colors to identify the number of ring castings per mold. This color serves as a guide to the pouring station operators as it is the key to the amount of metal required for each stack.

Large ring molding is very similar to the automotive with the exception that molds are placed in rows on the floor and poured at the end of the day.

The 46 molders on the rotary molding system are supplied with sand from a central sand mixing and conditioning system of the most modern design. The sand coming from the shakeout passes over a magnetic separator removing tramp iron from the sand. From here it is elevated to a bin directly over the two 8 ft. Simpson sand mixers. At this point the sand is accurately measured into batches automatically and dumped into the mixers; a certain percentage of new sand is added with a metered amount of water; the whole batch is thoroughly mixed, aerated an placed into the main storage bin. The sand as needed is taken from this bin, again aerated, and carried to the hoppers over the molding machines with a twin, scraper-type circular conveyor. The prepared sand is checked by the laboratory every half-hour to assure that specified permeability and moisture content are maintained.

Sand for the large ring molding is prepared on the floor and aerated with Royer sand blenders.

After the molds pass through the cooling zone on the conveyor, they come to the automatic shakeout machine. This equipment, located on the inside of the mold conveyor, was developed by Sealed Power engineers and built in its own plant. It is a turntable arrangement on which are mounted 12 separate vibrating units and the necessary circular conveyor to dispose of the sand. This machine rotates in the same direction and is synchronized with the mold conveyor. The ring molds are lifted from the mold conveyor with



Precision width and high finish are achieved on this battery of special automatic grinders.

List of Factory Executive Personnel

SEALED POWER CORPORATION GROUP

N. A. Moore.....General Manager
T. W. Edwards...Works Manager
J. Borgman .....Foundry Superintendent
B. J. Beebe.....Machine Shop Superintendent
H. Elliott .....Chief Inspector
H. Fors .....Production Manager
F. W. Dyer .....Plant Engineer
H. Cloud .....Chief, Manufacturing Planning Department
A. Bovich .....Chief, Time Study Department
H. Myers .....Chief Metallurgist
E. C. Young .....Foundry Engineer
H. M. Olsen .....Manufacturing Development Engineer
J. E. Porter .....Manufacturing Development Engineer

ACCURALITE DIVISION

A. W. Lines.....President and General Manager
K. R. Kopanka..Vice-President and Factory Manager
N. R. Bathrick...Superintendent
R. J. Bergen.....Chief Inspector
V. R. Bathrick...Chief Engineer
T. E. Nielsen.....Production Manager.

a specially designed hoist and placed on the units as they pass. These units shake the sand out of the molds and hoist the ring tree from the stack of empty flasks. The operation of stripping the rings from the sprue, removing empty flasks and ring castings from the shakeout is performed by operators stationed around this machine. From the shakeout, ring castings are loaded into pans in a flight conveyor which carries them to the basement where they are placed in steel barrels. In process each batch of castings is identified by the number of the molding operator for size; also, to place the responsibility for quality and spoilage.

Sprues from the shakeout machine are automatically dropped into a chute through the main floor into a continuous Sly tumbler located in the basement where the surplus sand is removed. The sprues, as they are discharged from this machine, are made up into charges ready to be remelted. The sprues from the large ring floor are cleaned in batches in other tumblers in the ring cleaning department.

Rings as they come from the ring sorting department, in steel barrels, are placed in Sly tumbling mills where the sand and shrink buttons are removed. After each load is thoroughly cleaned, it is loaded in tote trucks ready to be sent to the rough casting inspection department.

All ring castings are given an inspection for clean castings, sand holes, swells, and other foundry flaws before entering the machining department.

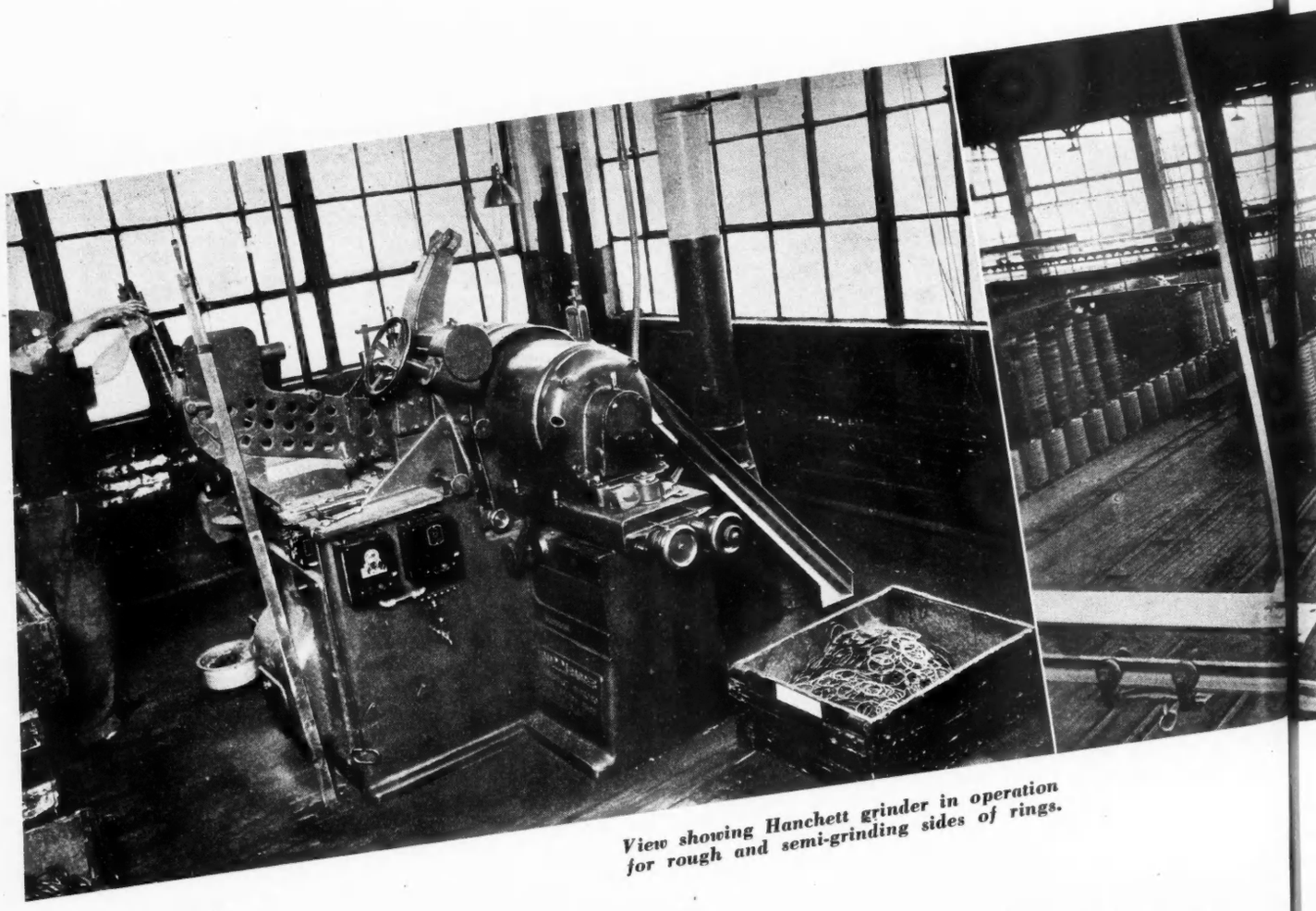
Machining Operations—Piston Rings

Ring castings are delivered from the foundry to the fourth floor of the machine shop where the first machining operation takes place. This first operation consists of rough grinding inner and outer surfaces, and is performed on a battery of special high-capacity grinding machines.

Ring castings must be carefully flattened by grinding with an equal amount of stock removed from each side to form a true width when completed. To approach these close requirements, rings are passed through a Hanchett grinder, with two grinding wheels mounted to allow rings to pass between. This method removes an equal amount of stock from each side leaving the ring true and flat. Rings are first rough ground, then semi-finished ground to width.

Rings are then passed to the finish grind department where the final precision width, flatness, and high finish are produced. These highly specialized grinders are a development engineered and built entirely by the company.

A battery of radial gap milling machines with cutters mounted on adjustable heads is used for milling out a segment in the ring so that in closed position the ring ends are radial. These machines are fully automatic and require the operators' full time in loading. One of the important elements in the operation of these machines is in clamping of the rings with more



View showing Hanchett grinder in operation for rough and semi-grinding sides of rings.

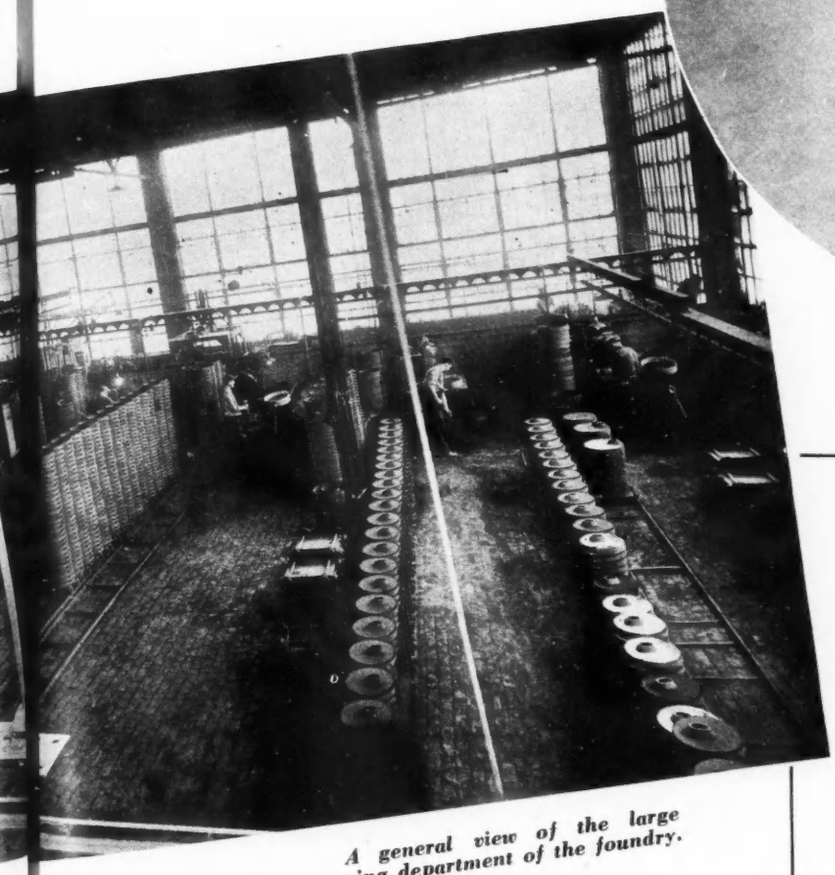
than 1000 lb. pressure at high speed without marring highly finished surfaces.

Rings are then rough turned in the rough turn department, on the outside diameter, on semi-automatic lathes, and routed to the finish milling department where ring gaps are milled to the required tolerances.

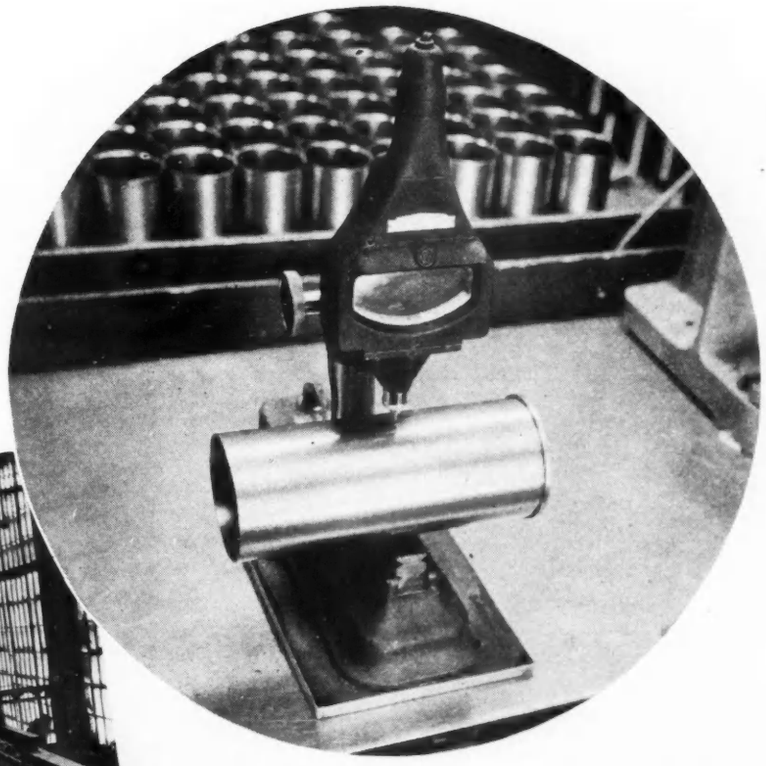
If the ring being machined is an oil control ring, it goes to the vent and channel mill department for milling of the channel and vents. Vent slot milling presents a unique method of holding gangs of rings in position for milling. One of its many features is a highly compounded air cylinder for clamping rings. Channel milling is similar to vent milling except that the milling machines are of double end spindle type with dual fixtures and provided with burring attachments.

The final machining operation for piston rings is performed in the finish turn department where the rings are finish-turned on lathes provided with special holding and turning equipment. This is a highly specialized operation for here the shape, finish, and circularity of ring are held under control by many patented features.

All rings for the replacement trade and certain quantities of original equipment rings, are treated in the Granoseal machine in which the surface of the metal is treated in a hot Granodine bath. Examination of the automatic processing machine in the illustration will show that the rings are hung on the con-



A general view of the large ring department of the foundry.



Sheffield shadow gage giving readings within 0.0001 in. is used for checking the O.D. of dry liners.

Products Distributed by Sealed Power Corporation

Piston Rings
Pistons
Piston Asemblies
Pins
Piston Skirt Expanders
Cylinder Sleeves
Wet Sleeve Assemblies
Valves
Guides
Springs
Keys
King Bolts
Bushings
Front End Parts
Water Pumps and Parts
Tie Rods
Tie Rod End Assemblies
Shackles
Piston Pin Bushings

Routing for Cast Iron Pistons

OPERATION AND EQUIPMENT

CASTINGS normalized to remove internal strains
Electric Furnace Co., gas-fired continuous furnace
BORE open end to exact size, face bottom to finished **LENGTH.** Work held in internal expanding air-operated chuck
Bardons and Oliver special purpose lathes
ROUGH DRILL pin holes
Special machine with Snyder drilling units
SEMI-FINISH turn outside diameter, rough- and finish-turn ring grooves
Fay automatic lathe with special slide for finish-turn grooves
Miscellaneous group including—drilling drain holes, piston pin lock grooves
FACE piston dome maintaining close dimension from pin hole center line
FINISH-TURN outside diameter
LeBlond rapid production lathes
GRIND outside diameter
Norton cylindrical grinders (or) Cincinnati centerless grinders
PRECISION BORE piston pin holes
Heald Bore-Matic
BALANCE for weight
Special balancing machine
Final **INSPECTION**

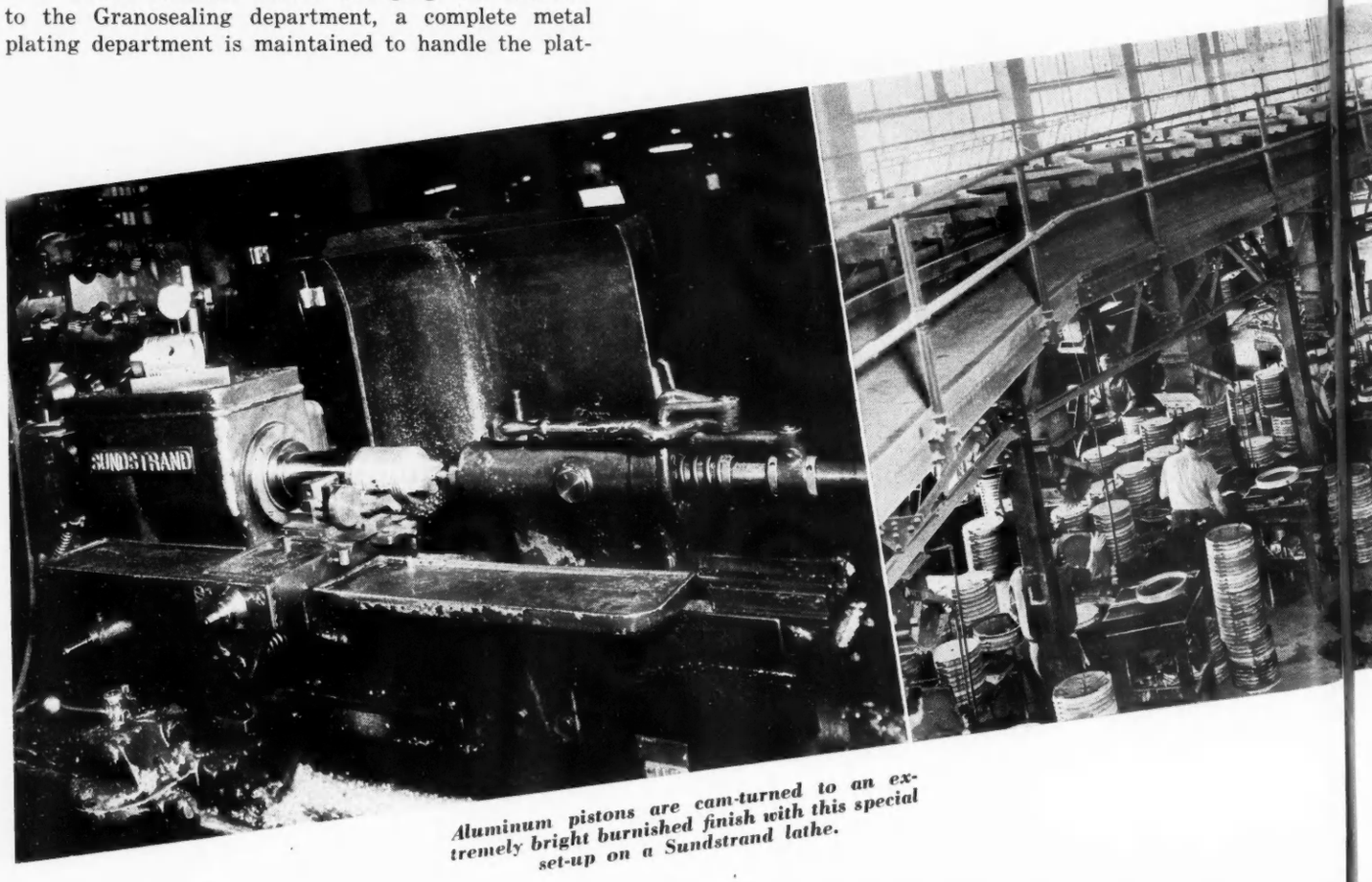
veyor racks, move through a wash and rinse, then enter the chemical solution tank. They are then rinsed, immersed in a tank containing soluble oil, and are dried in a heated chamber before emerging. In addition to the Granosealing department, a complete metal plating department is maintained to handle the plating of original equipment rings where required by the manufacturer.

All rings are routed to final inspection department and subjected to a 100 per cent visual inspection to detect surface flaws and obvious defects. Special gages and equipment are provided for checking ring gap, tension, width, circularity, flatness, wall thickness and squareness. Inspection benches are equipped with hoods which serve as reflectors for high intensity lighting, promoting better seeing for these exacting tasks.

Large rings, over 5 in. in diameter, are completely machined in a self-contained department with specially equipped facilities to handle all types and sizes. Due to the large variety of industrial installations required of these rings, special shapes, joints, inserts, keying, etc., are often required which necessitate the provision of special equipment, tooling, and methods. All contracting type rings are made here. All rings machined in this department are held to the same standards of workmanship and inspection as those produced in the regular production departments.

The tool room is centrally located on the third floor of the machine shop buildings and services all departments, building much of the special machines, equipment, and tools required in all parts of the establishment. Practically all machine and tool repair for the entire plant are handled by this department.

Important part of the engineering and development end of the business is a comprehensive dynamometer laboratory containing two large General Electric dyna-

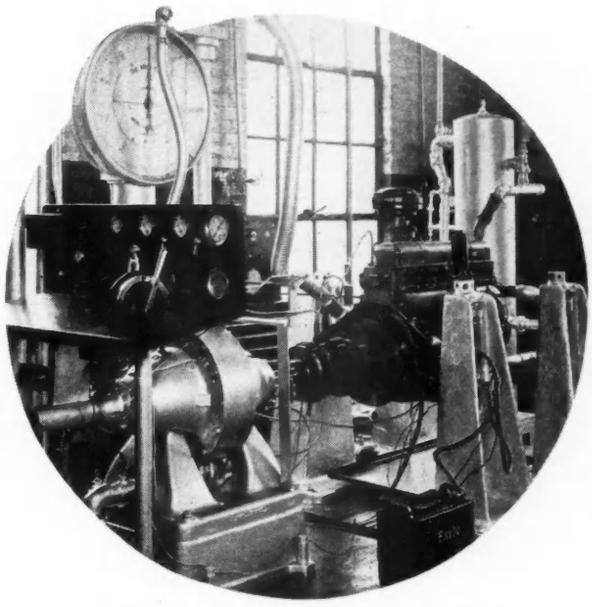


Aluminum pistons are cam-turned to an extremely bright burnished finish with this special set-up on a Sundstrand lathe.

mometers and one Taylor Hi-Speed hydraulic dynamometer. A General Electric water brake dynamometer is installed directly outside of the laboratory for cold testing during winter months. It is interesting to note that this department is maintained on a 24-hour schedule to keep up with the testing of new engines, models, new products, and studies of replacement parts.

A new modern two-story warehouse building was constructed in 1938 for the housing and shipping of Sealed Power and Accuralite products. These departments occupy 61,474 sq. ft. of floor space.

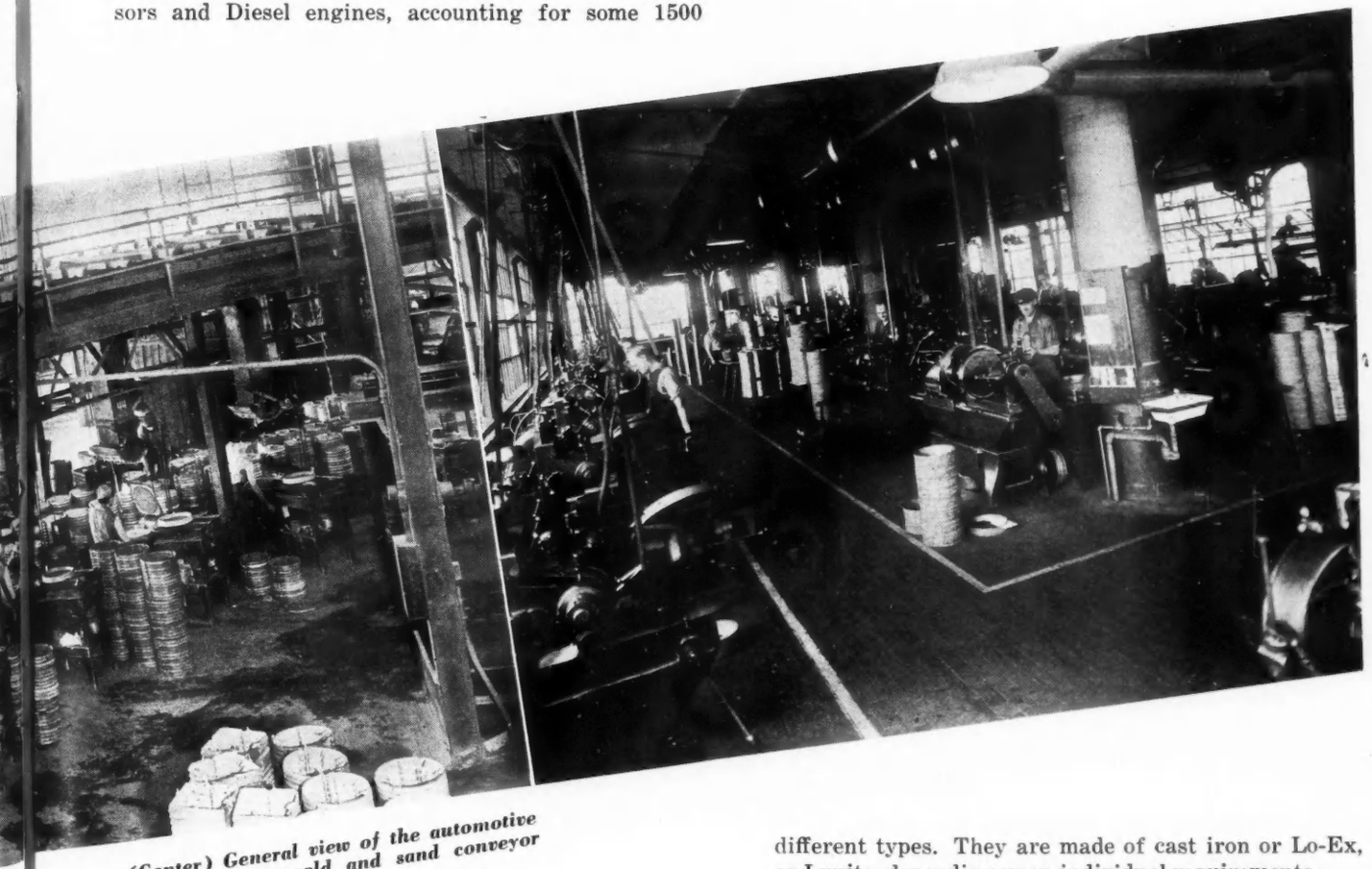
Millions of various sizes and types of rings are stocked, pre-packaged in spotless, well-lighted rows of bins, and are available for packing for shipment almost immediately upon receipt of orders from the many customers using these products. Orders are packed, double checked, and sent to the modern shipping room on a roller conveyor.



This Hi-Eff dynamometer represents the latest in modern equipment for brake testing motors.

Accuralite Division

This is a self-contained division housing all the facilities for the production of pistons and cylinder sleeves, with its own heat-treat department and inspection. Pistons range in size from the tiny ones for outboard motors to the largest used in compressors and Diesel engines, accounting for some 1500 different types. They are made of cast iron or Lo-Ex, or Lynite, depending upon individual requirements.

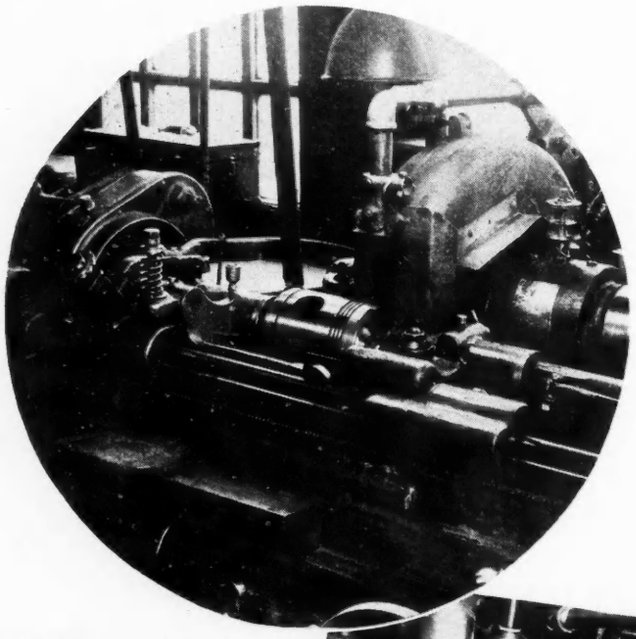


(Center) General view of the automotive ring molding, mold and sand conveyor systems.

(Right) General view of large ring machining department.

Cylinder sleeves are made both in wet and dry type in a variety of forms and sizes with about 50 designs in current production. The majority of these are intended for original equipment on Diesel engines, other heavy duty engines, compressors, etc.

It may be appreciated that the keynote of the ma-

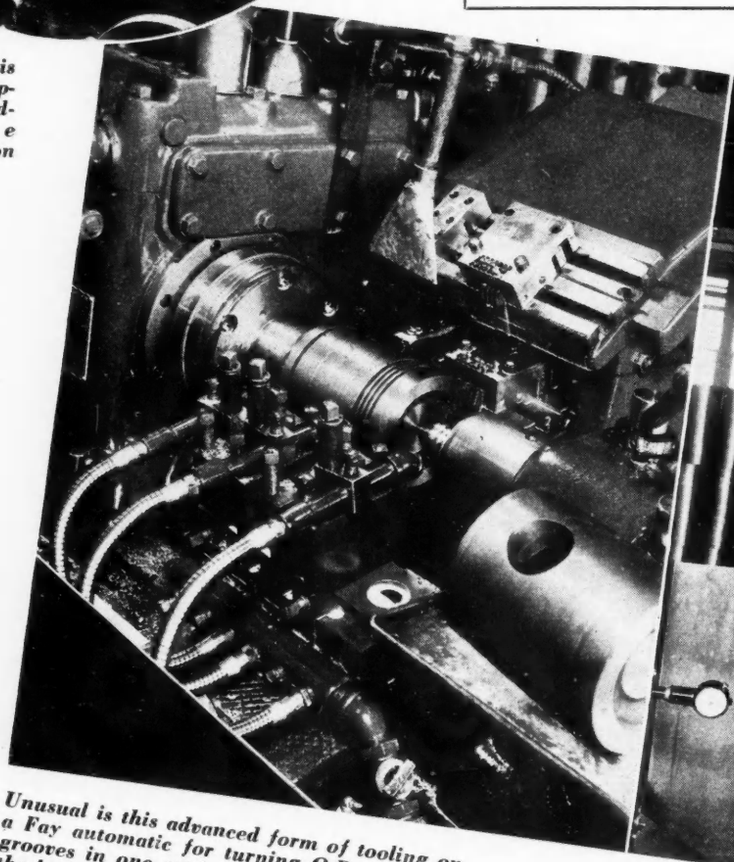


This Norton grinder is typical of the equipment used for grinding the outside diameter of cast iron pistons.

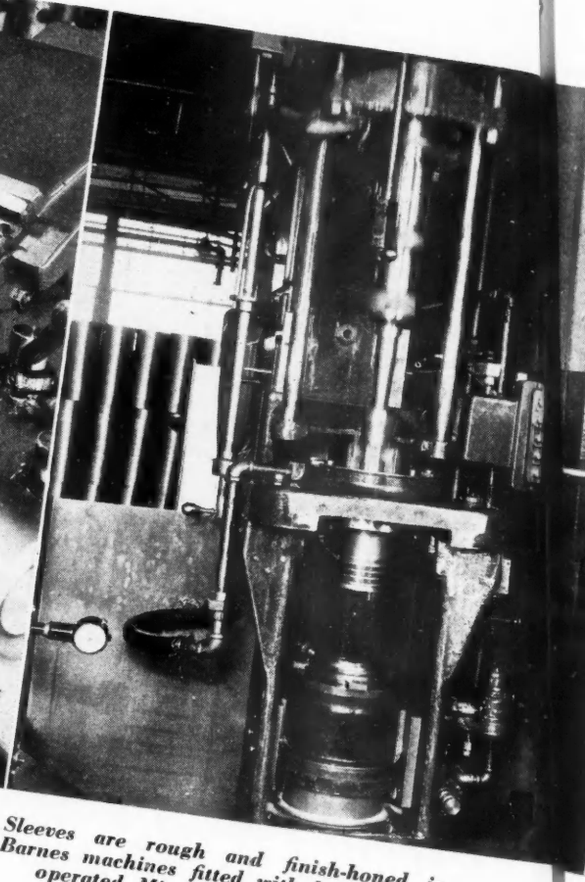
Routing for Cylinder Sleeve

OPERATION AND EQUIPMENT

CASTINGS normalized to remove internal strains
Electric Furnace Co., gas-fired continuous furnace
ROUGH BORE inside diameter
Moline Hole-Hog
SEMI-FINISH all outside surfaces
Fay automatic lathe
SEMI-BORE inside diameter
Special two-spindle machine
FINISH-TURN all outside diameters, turn flange width
Sundstrand automatic lathe
FINISH-BORE inside diameter
Natco Hole-Steel two-spindle boring machine
ROUGH AND FINISH hone inside diameter
Barnes honing machines with Micromatic hydraulic tools
Final **INSPECTION**
Sheffield Shadow gage



Unusual is this advanced form of tooling on a Fay automatic for turning O.D. and ring grooves in one setting. The special slide in the background finish-turns the ring grooves, coming in automatically after the preliminary operations have been completed.



Sleeves are rough and finish-honed in Barnes machines fitted with hydraulically operated Micromatic honing tools.

chine shop operation is flexibility both in equipment and in tooling to facilitate a rapid changeover of jobs. For this reason, the equipment is generally of unit type or universal type adaptable for a wide range of similar parts.

Among the more unusual items of equipment on the piston line are two Heald Bore-Matics—one for aluminum alloy, the other for cast iron. Each of the machines is of double-end type with three spindles on each end, one side for rough boring, the other side for finish boring the wrist pin holes. The fixture, of quick clamping type, is mounted in the center, holds three pistons at a time.

On aluminum pistons the wrist pin hole is finished to a tolerance of 0.0002 in. The three-station machine

fixture is arranged for both hydraulic clamping and hydraulic alignment of pistons. Pistons are located and clamped by first placing each one in a nest, then aligning the skirt by means of an adapter plate which fits in the counterbore.

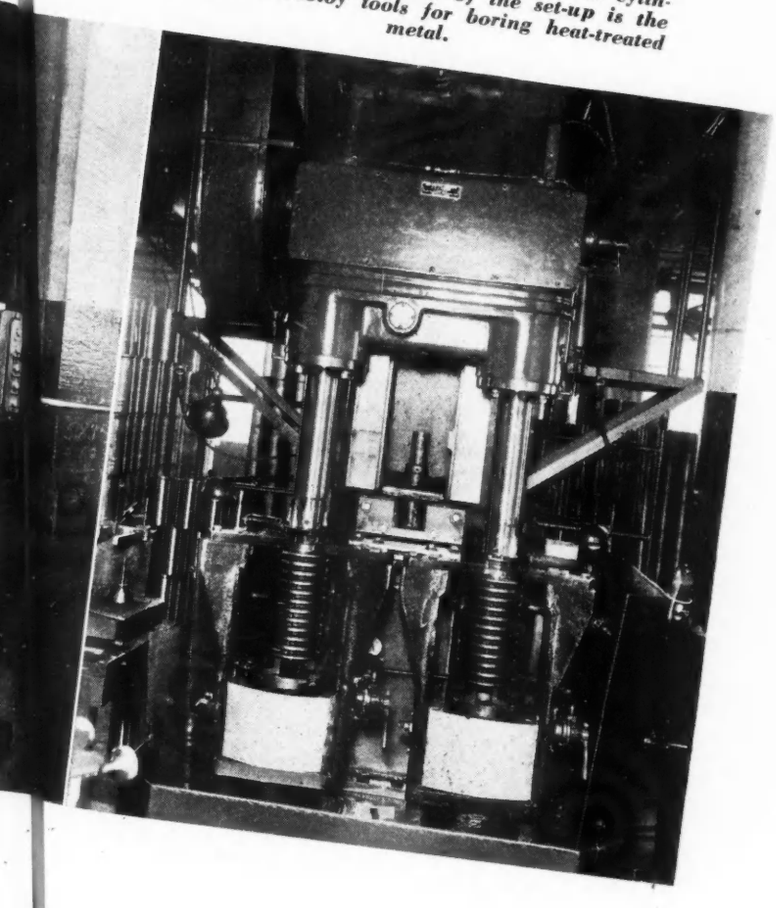
Alignment of the wrist pin holes with the boring spindles is accomplished by means of a hydraulic cylinder which actuates three sets of arms, each carrying a spring-loaded plug which enters the hole as the arms swing into position. Actuation of a second control lever brings another hydraulic cylinder into action, causing an overhead pivoted arm to swing down and clamp the pistons firmly in place by means of three floating plates.

Flexibility is achieved by using adjustable aligning arms and interchangeable adaptors, thus accommodating a large variety of piston sizes.

Three Fay automatic lathes, one of these a recent acquisition with individual motor drive, are used for finish turning and rough and finish ring grooving on cast iron pistons.

Unique feature of the tooling is the provision of a separate tool slide for finishing ring grooves. This slide is arranged to come in automatically after the initial operations are completed and the tool slides recede.

One of the two big Natco two-spindle machines used for finish-boring cylinder sleeves and liners. Work is closely held in special cylinders. Interesting feature of the set-up is the use of Carboloy tools for boring heat-treated metal.



Some of the wrist pin holes are finished by hand reaming on a special set-up using a Carboloy tipped tool.

One of the most interesting operations is found on a Sundstrand stub lathe fitted for cam-turning the outside diameter of pistons. This operation is performed with a diamond-pointed tool at the exceptionally high speed of 2000 r.p.m. It produces a beautiful burnished finsh. The Sundstrand lathe is fitted with a special driver attached to the spindle, so arranged as to drive the piston from a loose pin placed in the wrist pin hole. Cam contour is controlled by a special cam mounted to the stem of the driver. The cam follower is attached to the tool block, permits of oval forms up to 0.012 in. eccentricity in diameter, at speeds up to 2500 r.p.m. The machine is provided with a full automatic cycle of rapid approach, feed, automatic tool relief, rapid return, and spindle stop. Cincinnati centerless grinders are used for finishing the outside diameter of small pistons.

Cylinder liners have developed into one of the most active lines made by this company. Depending upon the users' requirements, liners are of electric furnace nickel alloy iron, sometimes with the addition of other alloys, supplied by Campbell-Wyant-Cannon Foundries. They are heat-treated to a hardness ranging from 450 to 550 Brinell, in a cycle of hardening, oil quenching, and drawing to relieve hardening strains.

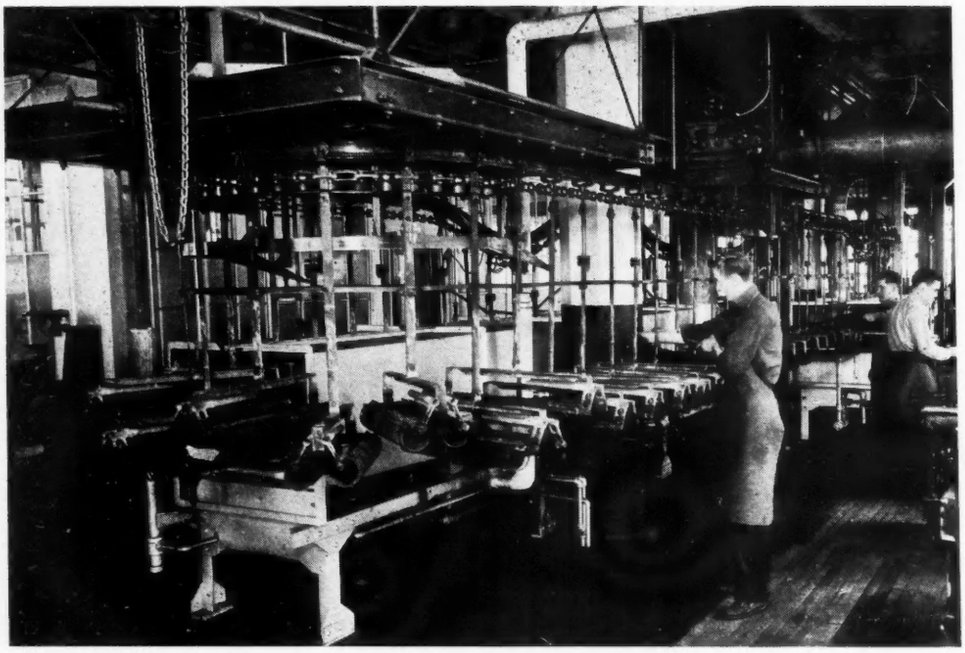
A truly outstanding operation in this department is the finish-boring of liners with Carboloy 999 alloy

Routing for Oil Control Ring

3-5/16 in. x 3/16 in.

OPERATION AND EQUIPMENT

MOLDING, includes instructions on pattern to use and size of flasks required
Pouring
Shake-out
Cleaning
Rough **INSPECTION** of castings
ROUGH GRIND outer surface of castings
Lehman grinder
ROUGH GRIND sides of rings
Hanchett grinder
SEMI-FINISH grind sides of rings
Hanchett grinder
GRIND inner surface of ring
Lehman grinder
FINISH grind sides
Sealed Power special grinder
ROUGH MILL out piece in ring
Sealed Power special automatic milling machine
ROUGH TURN outside diameter
Semi-automatic lathe
FINISH MILL gap
Sealed Power equipment
MILL ventilating slots
Sealed Powor special machine
MILL channel groove
Sealed Power special machine
BRUSH burrs from inside of ring
Heald machine
FINISH turn outside diameter
Special equipped lathe
Granoseal treatment
Final **INSPECTION**



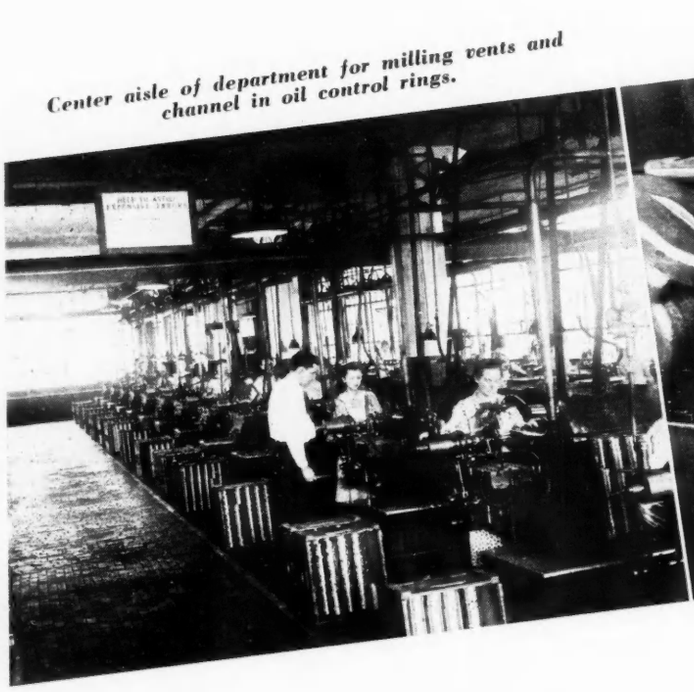
Secret of automatic mass production Granosealing is contained in this interesting automatic machine.

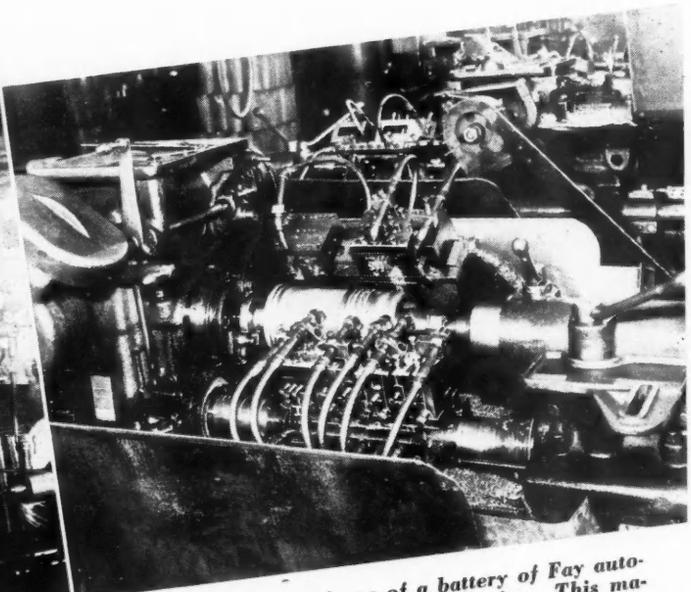
tools, on two huge Natco two-spindle boring machines. Each of the machines is served by a Heald sharpening machine for precision grinding of the Carboloy cutters. Each of the boring machines is a Model 3AH Natco Vertical Holesteel, arranged with a special two-spindle boring head. They weigh about 11,300 lb. without fixtures and tools.

Liners and sleeves are honed in two operations, after boring, on a battery of Barnes honing machines fitted with Micromatic hones that are hydraulically operated.

All cylinder sleeves are inspected in this department before shipment—checking outside diameter with a Sheffield shadow gage; inside diameter with a three-point self-aligning standard cylinder gage. The relatively thin dry sleeves also are subjected to a Magnaflux test to detect minute surface cracks or imperfections.

Center aisle of department for milling vents and channel in oil control rings.





(Right) Close-up of one of a battery of Fay automatic lathes in the Accuralite Division. This machine is set up and tooled for machining a cylinder sleeve. Work is held with a special type of internal expanding mandrel.

Design of High Speed, Two-Stroke Engines

By SCIPIONE TREVES, D.Sc., Mech. Engr.*

Section Five

In this section the author demonstrates the calculation of the supercharger and of the supercharging ratio

IN ORDER to be able to calculate the principal dimensions of the supercharger required, and the power that will be absorbed by it, it is necessary, first, to determine the amount of fresh air or mixutre in excess of the normal full charge, which is required for the proper operation of the engine. To this end we must briefly discuss the phenomena that take place inside the cylinder during the scavenging period, when for each unit volume entering through the inlet ports, an equal volume is expelled through the exhaust ports. The charge thus expelled generally consists in part of burnt gases and in part of fresh charge which has become mixed with them.

Considering the entire cylinder volume, $V_h + V_c$, as a unit volume, let x be the volume of fresh charge present in the cylinder at any particular moment t of the scavenging period, and y the volume of fresh charge which has entered the cylinder from the beginning of the inlet period up to that moment. Then, obviously, $y - x$ represents the quantity of fresh charge which has escaped through the exhaust ports during that period. Owing to the choice of units, x also represents the average proportion by volume of fresh charge in the cylinder contents. These contents are not of uniform composition, as a rule, being generally richer near the inlet and poorer near the exhaust ports.. Therefore, if we call z the volume of fresh charge contained in a unit volume discharged through the exhaust ports at the instant t, we have

$$z < x .$$

Hopkinson[1] holds that it is sufficiently close to the truth to assume that

$$z = x\,[1 - \lambda\,(1 - x)] , \quad \ldots\ldots\ldots\ (27)$$

where λ is a constant of stratification depending primarily on the dimensions of the cylinder and ports, and on their shape. For double-piston engines, in which the relatively great length of the cylinders and the uni-directional flow favor stratification, it may be assumed that

$$\lambda = 1.20 \text{ to } 1.35$$

It is immediately clear that equation (27) satisfies the conditions at the limits, for at the beginning of inflow, when $x = O$, the exhaust does not contain any fresh charge, and, therefore, z must be equal to O. Secondly, when a large quantity of fresh charge has already entered and the burnt gases therefore have been almost entirely expelled, the exhaust consists practically of fresh charge only, so that when $x = 1$, $z = 1$.

It follows that if a quantity dy of fresh charge enters during a time interval dt, an equal quantity dy which escapes through the exhaust ports during the same time, contains $(1 - z)\,dy$ burnt gases, hence the increase in the amount of fresh charge in the cylinder will be

$$dx = (1 - z)\,dy ,$$

from which it follows that

$$dy = \frac{dx}{1 - z}$$

that is,

$$dy = \frac{dx}{1 - x\,[1 - \lambda\,(1 - x)]} \quad \ldots\ldots\ (28)$$

Integrating this differential equation of the first order (which is easily effected by the usual methods for integrating rational functions), we have

$$x = \frac{1 - e^{-(1 - \lambda)\,y}}{1 + \lambda} \quad \ldots\ldots\ (29)$$

and

$$y = -\,\frac{\log \dfrac{1 - x^2}{1 + \lambda\,x}}{1 + \lambda} \quad \ldots\ldots\ (30)$$

*Formerly professor in the Royal College, Turin, Italy.

[1] See B. Hopkinson, *The Charging of Two-Cycle Internal-Combustion Engines*, Engineering, July 7, 1914, p. 100.

ENGINE DESIGN

Calculation of the basic dimensions of the supercharger therefore resolves itself into a determination of the value of y at the end of the inlet period for the particular value given to x. And as for values of x close to unity we would get very high values of y, which it would be difficult to obtain in practice on account of the great bulk of the supercharger required as compared with the size of the engine, it will be well to assign to x values between 0.80 and 0.87, and from the value of y thus arrived at, calculate the basic dimensions of the supercharger. In the value of y thus obtained (which, as already mentioned, refers to the entire cylinder volume $V_h + V_c$ since the compression space also must be scavenged) we may generally include the volumetric efficiency of the supercharger. However, in order to get the delivery of the supercharger expressed in free air, it must be remembered that the quantity $y\ (V_h + V_c)$ is given in terms of volume of compressed air at supercharging pressure. The ratio

$$\zeta = \frac{V''}{y\ (V_h + V_c)} \quad \ldots\ldots\ldots \quad (31)$$

between the quantity of fresh gas present in the cylinder at the beginning of the compression period (and therefore useful for power-generating purposes) and the quantity delivered by the blower through the inlet ports may be called the charging efficiency of the two-stroke engine. In high-speed engines with relatively high ports and relatively low values of V'''', this efficiency is rather low, usually of the order of 0.55 to 0.65.

We will now carry through the calculation of a blower which is suitable for the engine considered in Section IV. From equation (30), if we put $x = 0.85$ and $\lambda = 1.3$, we get

$$y = 1.145\,.$$

For this engine

$$V_h + V_c = 15.18 + 2.76 = 17.94 \text{ cu. in.}$$

for each cylinder, which makes the total volume of the six-cylinder engine 107.64 cu. in., and the amount of free air required per engine revolution figures out to

$$1.145 \times 107.64 \times 1.45 = 178.7 \text{ cu. in.},$$

1.45 atmospheres being the pressure at the blower outlet. It will, however, be well to increase the delivery capacity by another 10 per cent, to take account of losses in the pipes and in the inter-cooler (if one is used), which will make the delivery per engine revolution approximately

$$P = 200 \text{ cu. in.} = 0.115 \text{ cu. ft.}$$

In case the carburetor is located between the blower and the engine, the air delivery as thus calculated may be reduced in the proportion of 16:15, to take account of the fuel which will be added in the carburetor.

Let us suppose that a Roots-type blower has been chosen, which would probably be preferred because of its ability to develop appreciable pressures even at low speeds. Then, if we denote by A the effective area of the space between one rotor and the case (cross-sectioned in Fig. 14), and by l the length of the rotors, we evidently have

$$P = 4\,A\,l\,\frac{N'}{N} \quad \ldots\ldots\ldots \quad (32)$$

where N and N' represent the revolutions per minute of the engine and the blower respectively. If in a particular installation the blower is driven at engine speed, this reduces to

$$P = 4\,A\,l \quad \ldots\ldots\ldots \quad (32')$$

If we suppose that in our case the blower turns at engine speed, we have approximately

$$A\,l = 50 \text{ cu. in.}$$

The selection of values for A and l will depend on considerations of bulk in connection with the use of the engine. Sometimes a small transverse section and relatively great length will be found preferable, sometimes the reverse arrangement. It should always be remembered that great length reduces the rigidity of the blower and favors torsional vibration, which is particularly objectionable if it occurs in the balance. If we assume that the center distance between rotors is 3 in., which is equivalent to making the pitch-circle diameter of the rotors equal to 3 in., and if we make ϕ, the diameter of the smallest circle of the rotor, equal to 1.2 in., which leaves a sufficient section to draw in one piece at the ends the journals of the rotor, we can easily trace the profile (Fig. 14), from which we find

$$A = 4.75 \text{ sq. in.}$$

From equation (32′) we at once get the required length of rotor

$$l = 10.5 \text{ in.}$$

According to equation (31) the charging efficiency will be

$$\zeta = \frac{12.34}{1.145 \times 17.94} = 0.601$$

Having thus found the basic dimensions of the blower required, we can readily calculate the power which it will absorb, and therefore also the brake horsepower of the engine. The power absorbed by the blower is given by the equation[2]

$$N_c = \frac{778\,N}{33{,}000}\,c_p T_o \left[\left(\frac{p_l}{p_o}\right)^{\frac{\gamma-1}{\gamma}} - 1\right] \frac{P}{\frac{R\,T_o}{144\,p_o}} \frac{1}{\eta_{ca}\,\eta_{cm}} \quad \ldots \quad (33)$$

where c_p (= 0.24) is the specific heat of air at constant pressure. T_o, the absolute temperature (= 540 deg. R) and p_o, the normal atmospheric pressure, 14.7 lb. per sq. in., while the value of δ, the ratio of the specific heats of air at constant pressure and constant volume, is 1.41. P represents the volume of free air delivered by the blower per revolution of the engine.

$$P = 1.1\,y\,i\,p_l\,(V_h + V_c)$$

Of the two efficiencies, the mechanical efficiency η_{cm} of the blower varies between 0.93 and 0.95 and the thermodynamic efficiency η_{ca} between 0.55 and 0.60. The latter coefficient indicates how much the actual process of compression in the blower differs from adiabetic compression. In our particular case we get for the power absorbed by the blower at 6000 r.p.m.

[2] If, on the other hand, we had assumed that $z = x$, which amounts to assuming that the mixture of fresh charge and burnt gases is complete at all times, we should have obtained the equation $x = 1 - e^{-y}$.

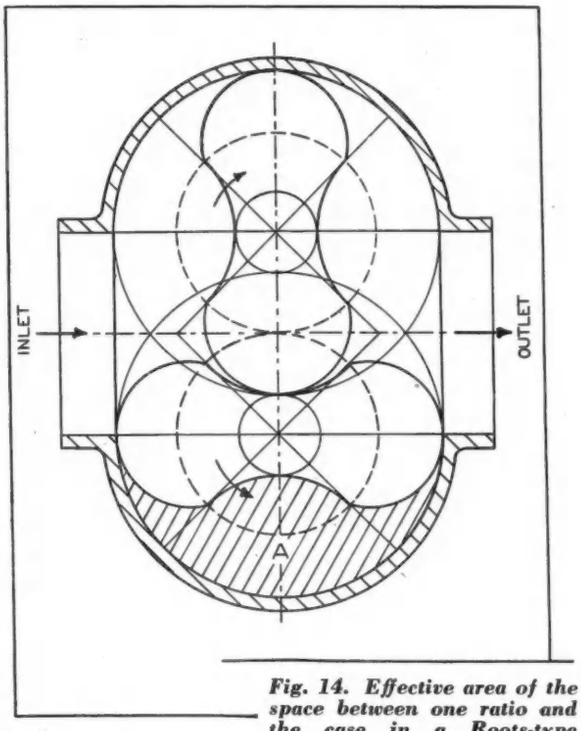


Fig. 14. Effective area of the space between one ratio and the case in a Roots-type blower shown at A.

$$N_e = \frac{778 \times 6000}{33{,}000} \times 0.24 \times 540 \times (1.45^{0.286} - 1) \times \frac{0.115 \times 144 \times 14.7}{53.3 \times 540} \times \frac{1}{0.6 \times 0.94} = 30.8 \text{ hp.}$$

Having found from a study of the indicator diagram that the mean effective pressure of the engine is 10.8 atmospheres, we get for the indicated power at 6000 r.p.m.

$$\frac{14.7 \times N\, V_h\, p_i}{12 \times 33{,}000} = \frac{14.7 \times 6000 \times 91.5 \times 10.8}{12 \times 33{,}000} = 220 \text{ hp.}$$

and asuming the mechanical efficiency of the engine to be 91 per cent, we get for the brake horsepower of the engine here under consideration

$$0.91 \times 220 - 30.8 = 169.2 \text{ hp.},$$

which corresponds to a brake mean effective pressure of

$$p_e = \frac{396{,}000\, N_e}{N\, V_h} = \frac{396{,}000 \times 169.2}{6000 \times 91.5} = 122 \text{ lb. per sq. in.}$$

The mechanical efficiency of the engine-blower group then is

$$\eta_{mt} = \frac{p_e}{p_i} = \frac{122}{159} = 0.77$$

It is interesting to compare these values of p_e and p_i, which were obtained by a careful study of the phenomena which take place during the operation of the engine, with similar values obtained from a rational application of the equations of classical thermodynamics. If we represent by h the lower heat value of one pound of the combustible mixture and make use of the familiar formula for the thermal efficiency

$$\eta_t = 1 - \left(\frac{1}{\rho}\right)^{m-1} \quad \ldots\ldots\ldots \quad (36)$$

which applies to an Otto-cycle engine, where m is the exponent of the compression and expansion polytropics, we find that

$$L_m = 778\, e\, \frac{h}{v'''}$$

is the mechanical work which may be obtained from every cubic inch of mixture present in the cylinder at the beginning of compression. If we multiply this by V''', we have the available work per cycle, and dividing by V_h we get the mean indicated pressure p_{it} of the theoretical cycle. Then, bearing in mind that one pound of gasoline yields 16 lb. of mixture and that, therefore, if $H = 18{,}400$ B.t.u. per pound is the lower heat value of the fuel, we get

$$h = \frac{H}{16}$$

and

$$p_{it} = \frac{778}{16}\left[1 - \left(\frac{1}{\rho}\right)^{m-1}\right] \frac{H}{v'''} \frac{V'''}{V_h} \quad \ldots \quad (37)$$

Putting $m = 1.3$, which is the average of the values obtained from indicator cards, we get for a compression ratio[3]

$$\rho = 6.5 \text{ ——}$$

$$\eta_t = 0.43 \text{ and } p_{it} = \frac{778}{16} \times 0.43 \times \frac{18{,}400}{10.37} \times \frac{12.34}{15.18}$$
$$= 3020 \text{ lb. per sq. ft.}$$
$$= 209 \text{ lb. per sq. in.}$$

From this it will be seen that p_{it} is greater than p_i, which is due to the fact that owing to the presence of the ports the effective compression ratio is only 4.22 instead of 6.5. Besides, the actual cycle differs from the theoretical one in other respects, and all these differences tend toward a reduction in the thermal efficiency. If we represent by

$$\eta_g = \frac{p_{it}}{p_i} \quad \ldots\ldots\ldots\ldots \quad (38)$$

the ratio between the work of the theoretical and that of the actual cycle then

$$\eta_i = \eta_g \times \eta_t \quad \ldots\ldots\ldots\ldots \quad (39)$$

η_i being the thermal efficiency of the actual indicated cycle and η_t that of the theoretical cycle.

Finally, it may be pointed out that the coefficient of economy, that is, the ratio of the heat equivalent of the brake horsepower to the lower heat value of the mixture furnished by the blower is given by the equation

$$e = \eta_i\, \eta_g\, \eta_{mt}\, \frac{x}{y}, \quad \ldots\ldots\ldots \quad (40)$$

from which it is possible to calculate the specific fuel consumption of the engine in lb. per hp-hr.

$$C = \frac{2545}{H\, e}$$

In the example we are here dealing with we have

$$\eta_g = \frac{10.80}{14.70} = 0.735$$

and hence

$$e = 0.43 \times 0.735 \times 0.78 \times \frac{0.85}{1.145} = 0.183$$

and

$$C = \frac{2545}{18{,}400 \times 0.183} = 0.76 \text{ lb. per b. hp-hr.}$$

It will be seen from the foregoing that whereas it

[3] See R. Devillers. Les Moteurs a Explosions, Vol. I, p. 85.

is possible with the two-stroke engine to obtain very high specific outputs and very high brake mean effective pressures—considering that a given b.m.e.p. in a two-stroke engine corresponds to twice that value in the four-stroke—we are still far from getting the same low fuel consumption with a two-stroke that is possible with four-stroke engines. Four-stroke racing engines are capable of developing one brake horsepower at a consumption of 0.60 lb., and large aircraft engines at a consumption of 0.49 lb. per b. hp-hr. which latter corresponds to a thermal efficiency of 28 per cent or nearly that of the Diesel engine.

In the future, efforts of designing engineers should be directed particularly toward improvement in stratification during the scavenging period, with a view to further increasing the ratio x/y, that is, diminishing the amount of mixture lost through the exhaust ports, and to the provision of greater turbulence with a view to increasing the factor η_{ig}, that is, decreasing the difference between the actual and the theoretical cycles.

Section Six will appear in an early issue

Some Details of the Rolls-Royce Merlin X Engine

FOR SOME years past it has been difficult to get particulars of new aircraft engines of the types suitable for military planes, but since the outbreak of the war, planes of all combattants have fallen into enemy hands and more or less detailed descriptions of their engines or certain features thereof have been published. Thus the British have published drawings and descriptions of the fuel-injection systems used on German Mercedes and Junkers aircraft engines, and the Germans in turn have published details of recent French and British engines, and even of the latest Wright Cyclone engine. Some details of the Rolls-Royce Merlin engine, which is to be produced in this country in large numbers, may be of interest.

The Merlin X is a 12-cylinder liquid-cooled engine with a two-speed blower which develops a take-off power of nearly 1100 hp. at 3000 r.p.m. This engine at present is the most powerful of those produced in large series for the British air service, and is mounted in practically all pursuit planes, notably the Spitfires and the Hurricane.

The water jackets of the cylinder block are cast with the cylinder heads, which are in one piece for the six cylinders of one bank. Long "through" bolts hold the liners in place between the cylinder head and the crankcase. The cylinder jackets do not extend all the way to the joint surface of the crankcase, and a watertight joint is effected between the jacket and the liners by means of rubber rings, each of which is subjected to the pressure of a spring of wavy shape. This enables the cylinder walls to compensate for temperature changes. There are four valves in each cylinder head, and these are actuated by overhead camshafts through the intermediary of rocker arms. Lateral openings in the jacket walls permit of the introduction of clamps which hold the liners in place in the engine block. Slots are sawed in the cylinder head castings between combustion chambers, with the object of relieving thermal stresses.

There is a flame arrester in the inlet manifold, which consists of a stack of very finely corrugated thin sheets of steel. While it is not so stated in the description, apparently the incoming charge has to pass through the narrow spaces between adjacent sheets, and while this should make the device quite effective as a flame arrester, it would seem to offer considerable resistance to gaseous flow.

The centrifugal blower is an independent unit and is mounted back of the accessories housing. It is driven through three centrifugal clutches. The rotor of the blower is in two parts. That part with which the air comes in contact first on entering the blower is made of steel, and has curved blades which scoop up the entering air, as it were, while that part which delivers the air to the diffuser has straight radial blades and is machined from a drop-forged blank of light alloy. As with the design chosen it was difficult to obviate the use of bolts through the diffuser, injurious effects of these bolts on the air flow are prevented by letting them form part of the diffuser vanes and giving them a flat cross section. Owing to the arrangement of the blower on this engine and to the location of such parts as the inlet manifolds, ignition harness, and charge and cooling-water equalization pipes in the Vee, it is impossible with this engine to mount a cannon concentric with the propeller shaft and shooting through the latter.

In commenting on the design of the engine, the German writer states that it is rather complicated and comprises a very large number of parts, which must add to the time and cost of production and render maintenance more difficult. For instance, when it is desired to remove the cover plates from the valve housings, a very large number of cap screws must be taken out. But while the design indicates that little attention was paid to production and maintenance problems, all details are worked out with great care, reflecting long experience and bearing witness to the high-grade of workmanship for which the Rolls-Royce firm has long been known.

The same as in other belligerent countries, severe restrictions have been placed on the operation of automobiles in Germany. The latest regulations limit the proportion of vehicles which may be operated to 15 per cent of the total. The aim is said to be to favor motor buses as much as possible.

AUTOMOTIVE INDUSTRIES

Just among Ourselves

No. 1 Job of Public Relations

AS THE leading article in this issue of AUTOMOTIVE INDUSTRIES you will find a factual statement of the depth to which Detroit, and the automotive industries in general are involved in manufacturing for national defense. Great as is the magnitude of the orders involved, and the scale of the preparations, it does not seem likely that the Government commitments to date will interfere much with the 1941 model program, particularly in passenger car production.

We do not believe, however, that potential buyers of 1941 automobiles understand that 1941 cars will be available in quantity. There is a tendency on the part of the public to overestimate the present role of the automobile industry in the national defense scheme. There is also a strong tendency to minimize the amount of mechanical change that will be found on 1941 automobiles. Because of innovations in color combination and surface styling, the public seems to believe that 1941 changes are limited to these surface manifestations.

In a good many cities, it has already been announced that there will be no automobile show. Lack of shows will inevitably be regarded by the public as corroboration of the view that there isn't much to show, and that it won't be easy to get 1941 automobiles anyway.

We urge the necessity of the industry telling the public, by all the resources at its command, the clear facts about the availability and the character of 1941 cars. At the present level of national defense preparations, and for some time to come, the industry can do its full share without serious impairment of its normal manufacturing program. The public deserves to know the facts in the case, and to tell them in clear detail, as an industry and, from the standpoint of individual plants, would be a form of patriotic effort.

Preservation of the normal economic structure of the country during the rush of national defense manufacturing programs will benefit from selling automobiles. The time may come when the defense program will necessitate curtailment of automobile manufacturing.

In any event, the public should be kept informed—by the industry—of the situation now, and in the future. This as we see it, is the number one public relations job of the industry at the present time—HERBERT HOSKING.

Two views of the Revacycle, a new mass-production machine designed by the Gleason Works for cutting straight bevel gears, such as those used in automotive differentials.

THE GLEASON WORKS, Rochester, N. Y., this month brings to the mass-production machine tool market a new piece of equipment which it calls the Revacycle. It is intended for cutting straight bevel gears, such as those used in automotive differentials. Gear teeth are both roughed and finished in one operation with a single disk cutter and, while the machine is arranged normally for the continuous production of one particular gear or pinion, the Revacycle can be set up to handle several jobs consecutively where quantities of each processed at one time are sufficient to warrant doing so.

Roughing and finishing blades are arranged radially on the cutter with a gap between the last finishing and the first roughing blade. The cutter is mounted on a reciprocating slide. While the cutter rotates in engagement with the gear blank, it moves along the lengthwise direction of the tooth space. As it moves from the small to the large end of the blank, the roughing blades rough out a tooth space. On the return stroke the finishing blades finish this tooth space. The blank is held stationary during cutting, and at the end of each return stroke of the cutter the blank is indexed at the gap in the cutter blades. Conjugate tooth forms are produced as a result of the cutter motions and the profile shapes of the cutter blades.

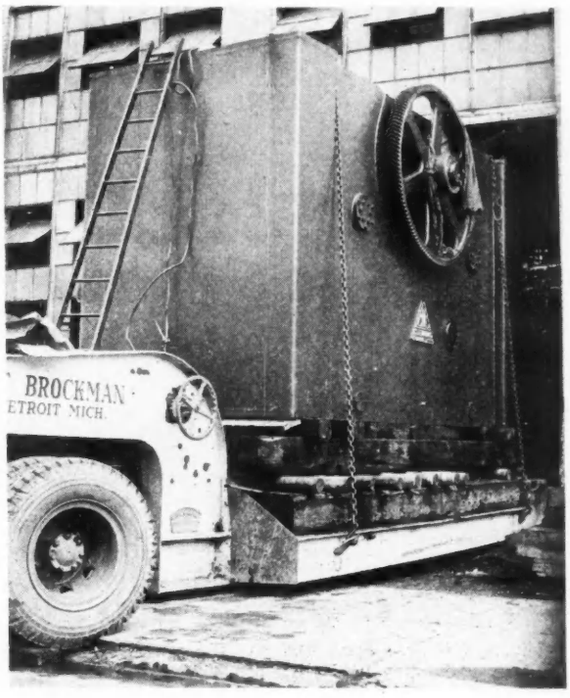
Except for chucking, the operation of the Revacycle is entirely automatic. Gears are removed and blanks loaded at two stations of the rotary work holding turret, while cutting takes place at a third. When a gear is completed, the turret indexes automatically to bring the next blank to the cutting station. After the blanks have been chucked, no further attention is required until two gears have been completed. While the equipment is in operation, a built-in conveyor deposits chips outside the machine.

The cutter spindle of the Revacycle is mounted rigidly on precision anti-friction bearings, provision being made for periodic greasing. Lubrication of moving parts other than the spindle is provided by a circulating oil system. The work is held in place by a heavy spring and is released automatically by a hydraulic piston. Clamping takes place automatically when the blank is chucked properly. The index for the work spindle is of the notched plate type with hardened and ground index plates. A hydraulic unit supplies power for clamping the turret after each turret index, for chucking the blank and for operating the chip remover.

Essential specifications of the machine are, as follows: Maximum cone distance, 3 in.; maximum face, 1½ in.; coarsest pitch, limited by a maximum depth of 0.450 in.; ratios from 1-1 and 2-1; pitch diameters from 2¾ in. to 5½ in.; index range from 8 to 40 teeth; floor space, 65 in. by 85 in.

MEN and

A RATHER unusual arrangement of a broaching machine was made recently by the American Broach & Machine Co., Division of Sundstrand Machine Tool Co., Ann Arbor, Mich., when this company set up one of its 4 HC-18 horizontal machines to finish broach half-round slots in several sizes of differential cases. Four slide units are provided, one on each of the four sides of the machine. All four of the cylinders are connected to the hydraulic pump unit. The machine is so designed that any one side may be operated, and that two adjacent sides may be operated simultane-



A whole section of factory wall had to be knocked out to allow this 52-ton crown of a huge Clearing Machine Corp. stamping press to be taken into the Buick sheet metal plant. Fully assembled, the press weighs 135 tons.

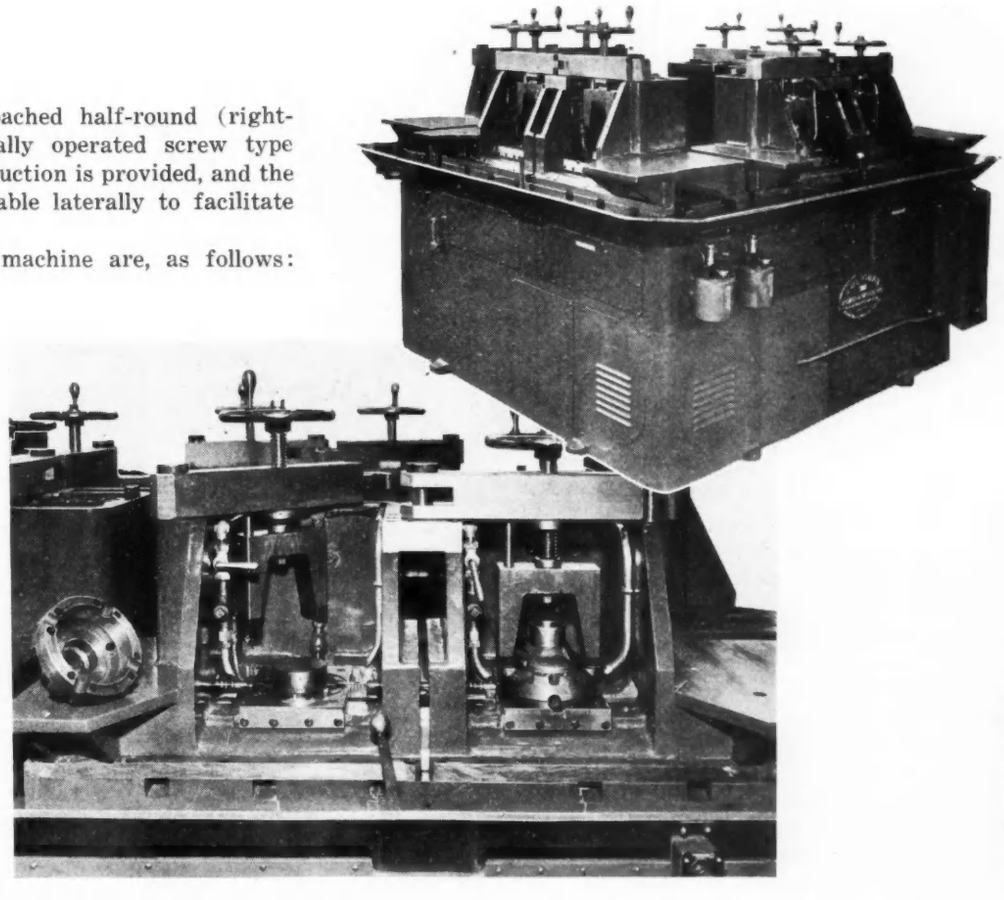
ously by two different operators. Separate machine control is provided for each cylinder slide assembly.

The fixtures are designed to locate from the joint counterbore or shoulder of the two parts forming one case assembly. One-half of the assembly is completed on two fixtures on one side of the machine, index for the first pass being taken from one of the flange holes (left-hand station) and for the second pass from the previously broached half-round (right-hand station). A manually operated screw type clamp of swing-out construction is provided, and the fixture plates are adjustable laterally to facilitate tooling set up.

Specifications of this machine are, as follows: Normal capacity, 4 tons per cylinder; cylinder diameter, 5 in.; broaching speed, 18 f.p.m.; return speed, 28 f.p.m.; cylinder stroke, 18 in.; work height, 40 in.; overall height, 50 in.; operating space, 14 ft. by 14 ft.

MACHINES

THE W. K. Millholland Machinery Co., Indianapolis, Ind., is building an improved model No. 4 universal turret lathe. The machine swings 20 in. over the ways and is furnished in 1¾ in., 2 in., and 2½ in. bar capacity. Longitudinal travel of the universal carriage is 24 in.; the turret ram being

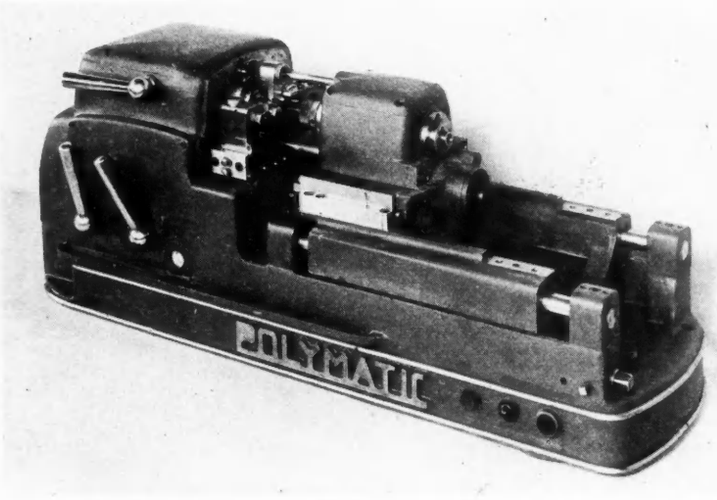


Two views of an unusual broaching machine built by the American Broach & Machine Co. This unit is equipped for finish broaching the half round slots in differential cases.

furnished with 12-in. travel. Motors are 5 to 7½ hp.

A new type of sub-base is of one-piece box construction and extends under the full length of the bed with finished pads of the bed at the headstock and turret ends bolted securely to the finished surfaces of the sub-base. Leveling screws are provided in the sub-base for leveling the machine.

Double row precision Timken roller bearings support the spindle at the front, and a large diameter precision ball bearing is used at the back. The spindle nose is heat-treated and ground with a taper pilot for mounting chucks, automatic bar chucks, or other work holding equipment.



The Unit Machinery Co.'s "Polymatic" high-speed screw machine.

The headstock has 12 speeds forward and reverse, from 35 r.p.m. to 715 r.p.m., with automatic spindle brake and Rockford multiple disk clutch. Three levers, marked "A," "B," and "C" are used for obtaining the 12 spindle speeds through sliding gears mounted on spline shafts.

The universal carriage is provided with both cross and longitudinal feeds, reversible in the apron. There are six feed changes in the apron, and an additional range of six feeds obtained through the gear box at the headstock.

Friction clutches are provided for both cross and longitudinal feeds. Feed trip-off for the longitudinal feed is operated automatically by six adjustable length stops. The cross feed has adjustable stops for tripping the feed in either direction. Feeds also may be tripped by hand, and a large diameter dial is provided for diameter setting.

The turret slide is operated by a turnstile rack and pinion. The hexagon turret is of large diameter and revolves upon a steel seat to which it is clamped by an automatically operated double bevel clamp. All operating functions of the turret, including automatic clamping are controlled by the movement of the turnstile handle. The turret saddle has six feed changes in the apron, and an additional six feed changes through the gear box at the headstock.

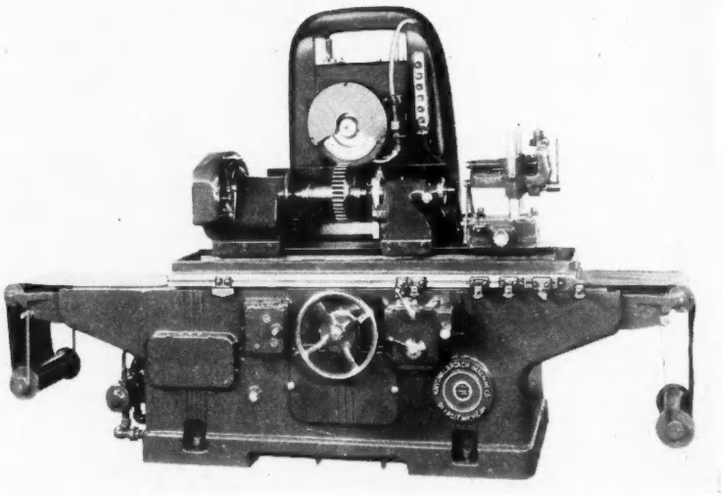
Engagement of the turret feed is by a large diameter friction clutch. Feeds are tripped automatically by independent adjustable stops. These stops operate automatically for each position of the turret. Stops are threaded their full length and are adjusted readily for the length of each cut. A binder screw clamps each stop when set.

A NEW model electric-hydraulic riveting press has been made available in capacities of 10 to 100 tons by the Hanna Engineering Works, Chicago. Motor, pump, controls, piping, cylinder, and reservoir of the new press are totally enclosed, although front and rear panels may be removed in less than a minute to make motor, pump and reservoir accessible. A side panel affords access to the controls. It is possible to lift the entire machine out of its base without disturbing a hydraulic, electrical or mechanical element.

From one to six or more rivets may be driven simultaneously with this equipment. According to the manufacturer, equal pressure is exerted on each rivet regardless of variation in length, hardness of the rivet, or ordinary variation in grip. Omission of one or more rivets will not result in damage to the work or to the machine.

Live or driving dies may be above or below, and a complete riveting stroke of all dies can be accomplished it is said in less than two seconds.

THE National Broach & Machine Co., Detroit, is offering a new Red Ring machine for precision grinding of master gears and involute broaches. The

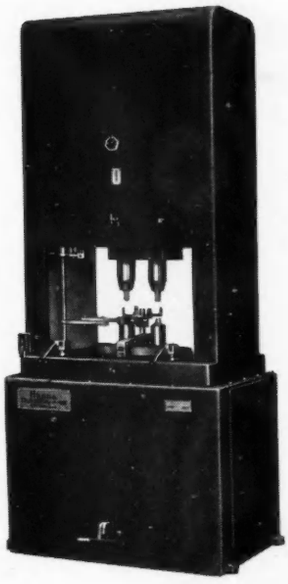


A new Red Ring gear grinding machine manufactured by the National Broach & Machine Co.

spindle of the machine is integral with the motor rotor. A handwheel is used to make up and down adjustments of the spindle slide. Hydraulic counterbalance removes backlash from the leadscrew. Operation of the down feed against hydraulic pressure is said to eliminate the possibility of the head sticking when small increments of feed are desired.

The table slide is reciprocated hydraulically and is controlled automatically through a feed box which is mounted on the front of the machine. A cam on the table slide provides force feed lubrication to the ways at each stroke. Combination V and flat ways are covered at all times by a canvass roll.

The index head is furnished with either fully automatic or semi-automatic control, as desired. For gear tooth work, a template control trimmer is provided which trims both sides of the wheel simultaneously. The table feed box includes a dead stop which brings the wheel to the trimming position so that the diamond points operate in line with the center of the wheel. The radius trimmer is mounted in the tail stock. Diamond points are adjustable up and down and may be set with a micrometer.



The latest addition to the line of electric-hydraulic riveting presses built by the Hanna Engineering Works.

A HIGH-SPEED screw machine for cutting small size stock, known as the Polymatic, is being manufactured by the Unit Machinery Co., Rockford, Ill. The No. 01 machine handles stock up to 5/32 in. diameter and the No. 11 machine has a maximum capacity of 5/16 in. diameter round stock. Both units are fully automatic in operation, requiring only restocking with bars and occasional resharpening of tools. The machine may be had in either bench or floor mounted models. In either instance floor space requirements are very small.

The heat-treated alloy steel spindle is mounted on precision anti-friction bearings. The front bearing is of a double row roller type with the inner race seated on a taper portion of the spindle, permitting easy adjustment of clearance. The rear end of the spindle is supported on two radial thrust type ball bearings.

A standard push-out type collet and a standard feed finger and feed tube are contained in the spindle. The stock feed operation is originated by a closed harmonic cam. Hardened and lapped, alloy steel, helical gears drive the spindle. A friction clutch is provided for starting the spindle rotation and feed movements.

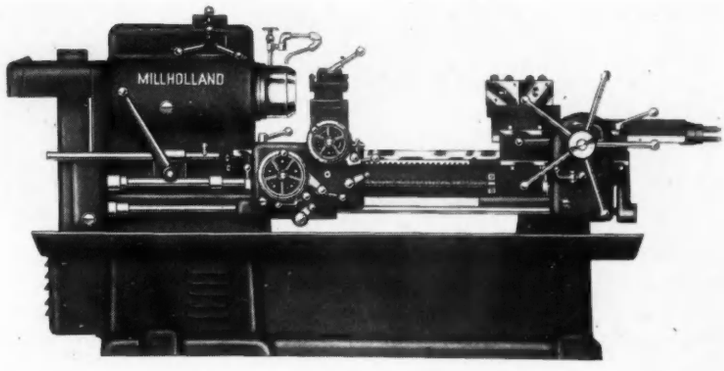
Cross slides are of hardened and ground steel sliding in fine grained cast-iron ways, properly gibbed. They derive their movement from individual plate cams. A fully adjustable tool holder is mounted on top of each of the cross slides.

The tool slide may be equipped with one to three end operating tools mounted on top of a compound slide. The various operations that may be performed include drilling, reaming, turning, knurling, etc.

The pickup spindle, an optional attachment, is geared to the main spindle and revolves in unison with it. The spindle nose carries a collet for chucking the part while the latter is being cut off. This method prevents the premature breaking off of the part with a resultant burr.

All feed movements are controlled from a common camshaft. Speed of this camshaft is variable to make one revolution in 3/4 to 24 sec. by means of pickoff gears, according to the time required to make one part. A lever-operated clutch selects power or hand feed. In the hand feed position the operator can revolve the camshaft with the spindle running or stopped. The collet may be opened manually by means of a separate hand lever.

The stock tube is of the proper dimensions to handle bars up to 12 ft. in length and is built with a silencer for quiet operation when used at high speeds.



An improved design of the No. 4 Millholland ram type universal turret lathe.

THE FOLLOWING new items of equipment have been brought to the attention of this column within the past month:

Timken Roller Bearing Co., Canton, Ohio—Modified design of standard NA type, or non-adjustable roller bearing. Made up of a double row outer race or cup and two single row inner races or cones, it is adapted especially to serve as a sheave bearing.

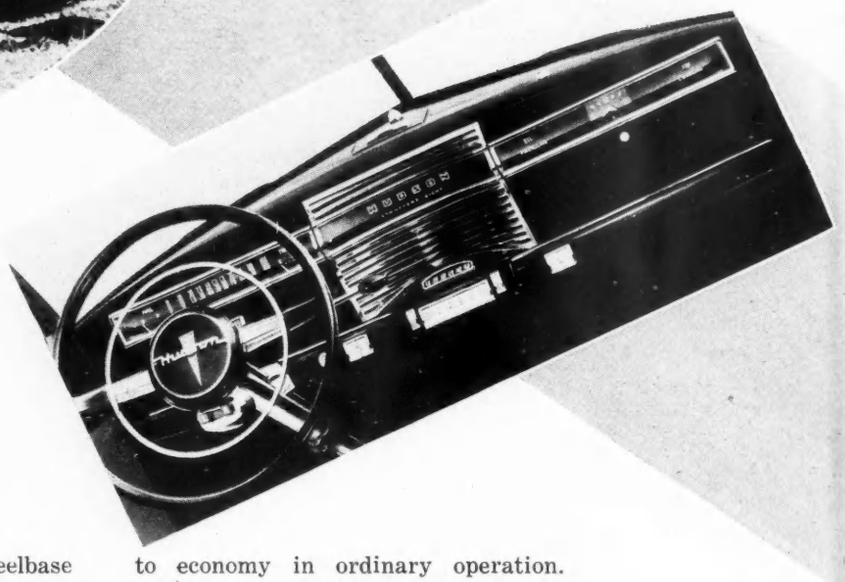
Mahr Mfg. Co., Division of Diamond Iron Works, Inc., Minneapolis, Minn.—A new type of center fired rotary forging and heat-treating furnace. Single

(*Turn to page* 234, *please*)

New Body

Hudson's new 1941 front-end exhibits highly decorative chrome treatment. For 1941 the die-cast and chromed front grilles are wider and extend closer to the newly-designed center bar.

Hudson's new 1941 instrument panel carries through the entire line with slight variations in ornamentation and convenience.



IN THREE new lines of cars for 1941 the Hudson Motor Car Company presents what they term as "Symphonic Styling." New bodies, longer wheelbases and new measures for safety, driving ease and performance mark the new lines. This year Hudson offers complete color harmony in a full line of motor cars in standard production.

In the lowest price field for 1941, Hudson has a new 92 hp. Hudson Six, on a wheelbase increased to 116 in., 3 in. longer than previously, with a longer, lower body of striking new design. A still lower priced model, the Hudson Six Traveler, with the same power and wheelbase, completes the company's entries in the lowest price division of the market.

Just above this lowest priced line is a new 102-hp. Hudson Super-Six, with a wheelbase increased to 121 in. An entirely new series of models, known as the Hudson Commodore Series rounds out the 1941 line.

A new synchro-mesh transmission is featured in all new 1941 Hudsons. All gears are helical, giving extremely quiet operation in second and low as well as high gear. The new design also permits more efficient operation of the remote control gear shift because there are fewer connections through which the motion of the shift control lever must be transmitted.

Hudson's overdrive is also new for 1941. Over a dozen parts have been eliminated, and the operation is not only simplified but changing to overdrive or dropping back to regular drive is accomplished with complete smoothness. Overdrive also comes into operation at a somewhat lower speed, which contributes to economy in ordinary operation.

Hudson's Double-Safe hydraulic braking system, with a separate reserve mechanical system that takes hold automatically from the same foot pedal, is further improved for 1941. New larger Centrifuse brake drums are standard on all new 1941 models. Brakes on the new Hudson Six are 10 in. in diameter and all Eights carry 11-in. brakes.

Hudson's Auto-Poise Front Wheel Control has been further improved for greater strength and longer life.

The Hudson Six has a 6-cylinder L-head motor with a 3-in. bore and 4⅛-in. stroke giving 175 cu. in. displacement. It develops 92 hp. at 4000 r.p.m. with a compression ratio of 7:25 to 1.

The 121-in. wheelbase Hudson Super-Six and Commodore Series six-cylinder cars have L-head motors with a 3-in. bore and 5-in. stroke giving 212 cu. in. displacement. The engine produces 102 hp. at 4000 r.p.m. with a compression ratio of 6:5 to 1.

The Hudson Commodore Eights on 121-in. wheelbase and the Commodore Custom Sedans on 128-in. wheelbase have an eight-cylinder L-head engine, with

Styling on Hudsons

3-in. bore and 4½-in. stroke, giving 254 cu. in. displacement and producing 128 hp. at 4200 r.p.m. The compression ratio is 6:5 to 1.

A wide range of 1941 body types is available throughout the entire line. These consist of 2-door and 4-door sedans, 3-passenger coupes, 6-passenger club coupes and 5-passenger convertibles. In the Commodore Custom Eight series a touring sedan on 128-in. wheelbase, and a club coupe on 121-in. wheelbase are featured.

Tire sizes on the lowest priced Hudson Traveler are 16 x 5.50; on the Hudson Six and Super-Six, 16 x 6.00; on the new Commodore Sixes and Eights, 16 x 6.25; and on Commodore Custom models, 16 x 6.50.

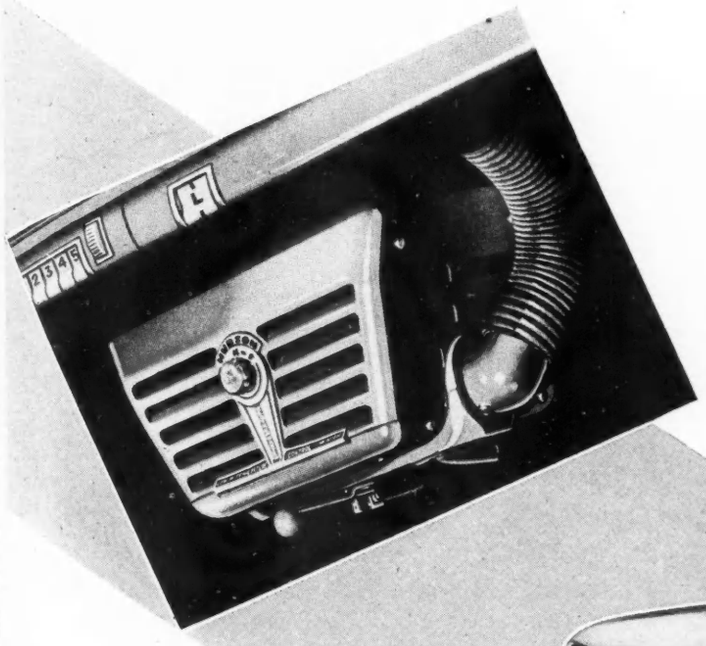
All the new 1941 Hudsons are lower, longer and more graceful in "silhouette." Noteworthy in the new body styling is the sweep of the new rear-end design with the accompanying new design of rear quarter windows and roof panel. This new rear body styling is in combination with a 2-in. reduction overall body height and an increase in body length of 5½ in. The 2-in. reduction in body height is achieved by a new flatter roof line and changes in suspension which allow the entire car to sit closer to the ground without sacrifice of useful head room or road clearance.

Length and lowness in the new 1941 Hudson body styling is emphasized by a wide chrome belt moulding which begins at the front of the bonnet and sweeps the entire length of the car, terminating near the curve of the new rear deck. In the Commodore series, this belt moulding is set off by a band of color running its full length. New safety-type door handles are streamlined into the belt moulding. Door hinges are concealed in the body.

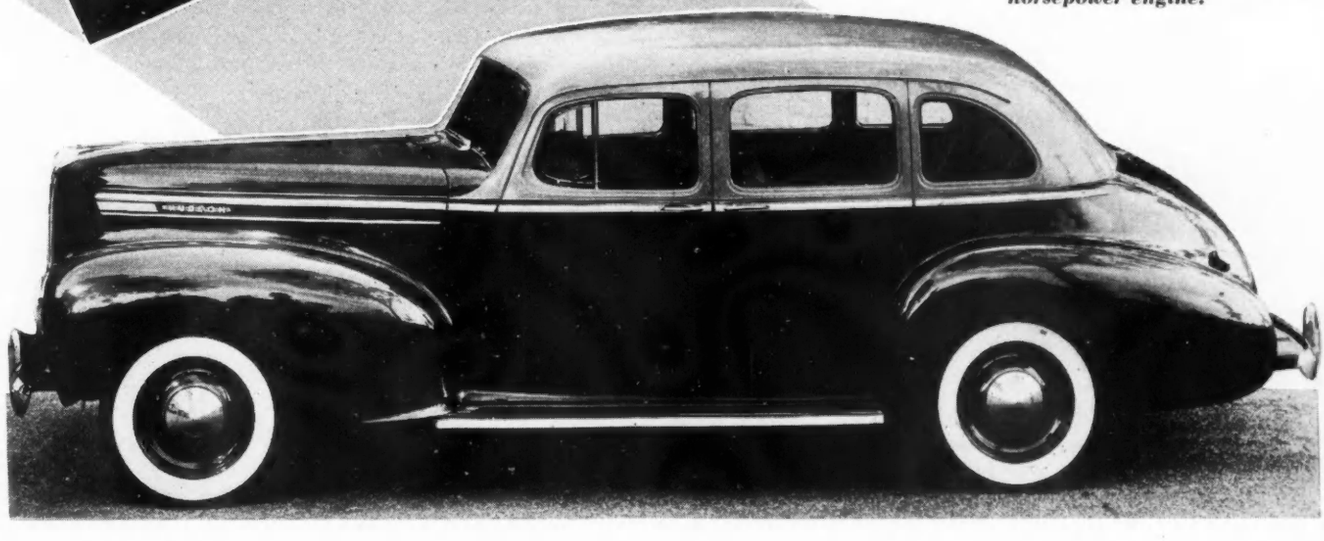
Front-end styling maintains an unmistakable "family resemblance" to last year's design, yet is a more decorative treatment.

For 1941 the die-cast and chromed front grilles are wider, heavier, spaced closer together, and increased in number from 7 to 9. They also extend closer to the newly designed center bar which carries a new type radia-

(*Turn to page* 236, *please*)



Hudson's improved 1941 Weather-Master with Thermo-matic control heats and circulates fresh, clean air when the car is in motion. In hot weather, the same unit circulates fresh, filtered cool air.



This new 1941 Hudson Six sedan features longer, lower body design, longer wheelbase and a new styling development. This model is mounted on 116-inch wheelbase, 3 inches longer than previously, and is powered with a 92 horsepower engine.

NEW CARS

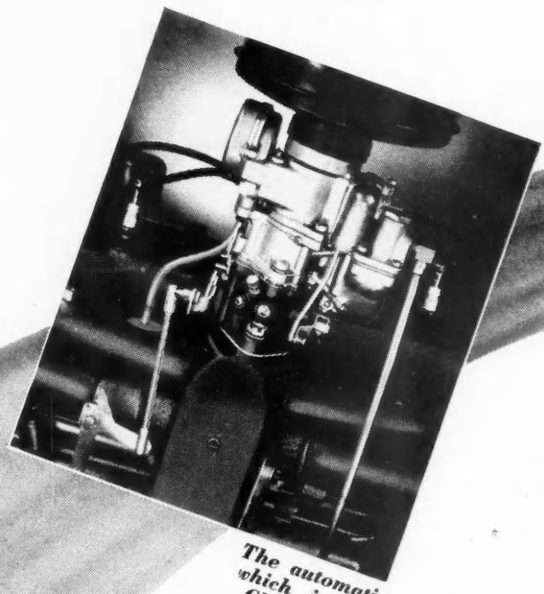
Studebaker Makes

STUDEBAKER'S announcement for 1941 lays emphasis on a new body, the Land Cruiser, which was designed by the well-known stylist, Raymond Loewy. Cars equipped with it are lower and roomier than any previous Studebaker, and every effort has been made to create additional style appeal.

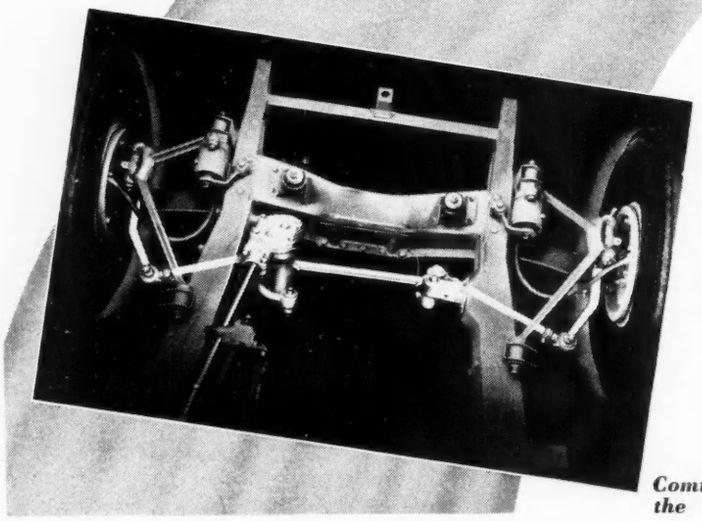
The 1941 Studebaker line again consists of three chassis models, the Champion, the Commander, and the President. The Champion, the low-priced Studebaker, is available with coupe, two-door and four-door sedan bodies, in custom, custom deluxe and deluxe-tone editions. Commander and President lines each include a four-door sedan and a Land Cruiser four-door model. In the Champion line buyers are offered a choice of three kinds of upholstery material in eight colors.

The new Champion has a six-cylinder L-head engine of 3 by 4-in. bore and stroke (instead of 3 by 3⅞ in.), with a displacement of 170 cu. in., and the horsepower rating is now 80 at 4000 r.p.m. The compression ratio remains 6.5. Pistons of aluminum alloy, tin-plated, are provided with a heat dam and equipped with Ferrox non-scratch rings. Valves have mushroom-type lifters and horseshoe-type spring retainers. The camshaft is driven through a Celoron gear. An automatic choke is now furnished. Lubrication is by the full pressure system, the gear-type oil pump being mounted on the valve side of the engine. The water pump has ball bearings and a mechanical internal seal, and it is driven by a V-belt.

The carburetor is of the downdraft type with full automatic heat control and auto-



The automatic choke which is new on the Champion this year.



Commander steering linkage, showing the rubber - insulated steering arm

1941 Bow

Studebaker President Land Cruiser with deluxe-tone finish

matic choke. Intake and exhaust manifold form a single unit. The fuel tank has a capacity of 15 gals. The distributor is equipped with a full-range automatic spark control. The generator has both current and voltage control, while the starting motor, which is controlled by a switch under the clutch pedal, is of the inboard type.

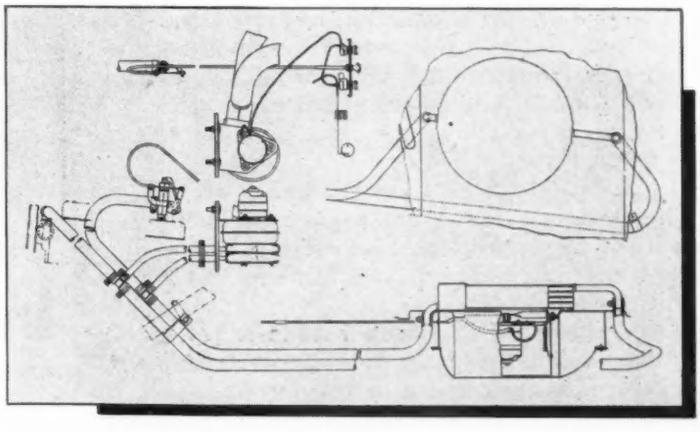
The transmission has silent helical gears and synchronizers. Propeller shafts on all models are of the solid type, with the slip joint built into the transmission rear flange, which slides on the transmission main shaft. Overdrive is available on all models. The rear-axle ratio is 4.56 in sedans, 4.10 in coupes, and where an overdrive is fitted the combined reduction ratio is 3.29. Champions carry 16 by 5.50 tires.

The rear axle is driven through hypoid gears, with a ring-gear diameter of 7¾ in. Hydraulic brakes act on cast-iron brake drums and are actuated through a 1-in. master cylinder. The parking brake, which is mechanical, acts on the rear wheels. A hill-holder is available at extra cost. Shock absorbers are double-acting hydraulic.

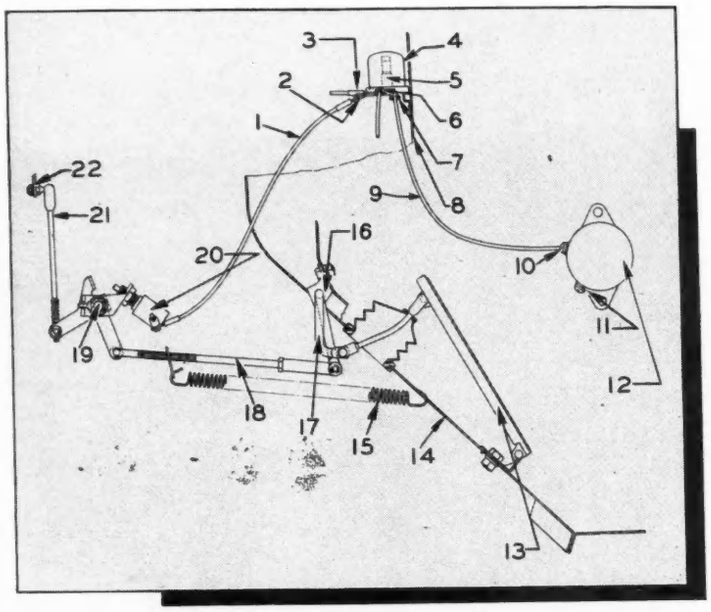
One leaf has been added to the transverse leaf spring of the Planar independent front suspension. Threaded pins are used at the outer ends of the control arms. Rear springs are made up of leaves with parabolic-edge section, the spring material being silico-manganese steel. Spring covers are standard equipment. The steering gear, which is of the cam-and-twin-lever type, has a ratio of 13:1. The joint of the drop arm is rubber-insulated, and the linkage is of the symmetrical type. A 17-in. steering wheel is fitted.

The over-all length of the Champion is now 190½ in.; the free height, 66 in., and the loaded height, 64½ in. Front-seat width has been increased from 52 to 54¼ in., rear-seat width from 46¼ to 48 in. The car is 72¾ in. wide across the rear fenders. There are no running boards on the all-steel body. Gravel deflectors are built into the rear of the chassis. Gravel guards on the front of the rear fenders are standard on custom deluxe and deluxe-tone models.

Door hinges are of the concealed type, as are the hinges of the trunk compartment lid, which latter is counter-balanced. Rotary door latches are used. All doors have weather-stripping all around. Wings are adjusted to keep rain and wind out. The hood lock is controlled from the dash by means of a Bowden wire. While this is the only means of unlocking it,



Installation drawing of the Climatizer. There is now a separate heating core for the defroster



Wiring and mechanism of solenoid control for overdrive

1. Black wire
2. "TH SW" Terminal
3. "Bat" Terminal
4. Relay
5. 14 Amp. Fuse
6. "IGN. SW" Terminal
7. "Sol" Terminal
8. Dash
9. Red Wire
10. "SW" Terminal
11. "IGN." Terminal
12. Transmission Solenoid
13. Accelerator Pedal
14. Toe Board
15. Accelerator Return Spring
16. Bracket
17. Accelerator Cross Shaft
18. Accelerator Rod
19. Manifold Boss
20. Control Switch
21. Throttle Rod
22. To Carburetor

the hood can be locked also from the outside. All new Champions are prepared for the installation of the Studebaker Climatizer. Provision is made for an air intake on the left side of the cowl panel, the air being carried through a duct under the floor pan to the heater, which also filters the air. There also is a ventilator on the right cowl panel which admits fresh air directly to the passenger compartment. It is fitted with double insect screens. The construction permits of the use of a combined cowl inner panel brace and gusset, and eliminates the need for a top ventilator.

Windshield cleaners are vacuum-operated. Head lamps are of the sealed-beam type. The large, low-mounted front grilles are die-cast.

Upholstery cloth in two different colors is available in the Custom line, and in three color combinations in the Custom deluxe line, while in the deluxe-tone line three combinations of broadcloth are being offered as standard. Garnish moldings are painted to harmonize with the broadcloth and Bedford cord type upholstery.

Hardware consists of chromium-plated metal parts with knobs and escutcheons of plastic material. The instrument panel is entirely new, with a parcel compartment on the right-hand side and the instruments mounted behind the left panel. Chromium trim is used generously throughout.

The rear window is one-piece, of curved, tempered glass. The spare tire is carried in the trunk compartment, which this year has 17.5 cu. ft. additional room in sedans and 41 cu. ft. more in coupes, not counting the space occupied by the tire.

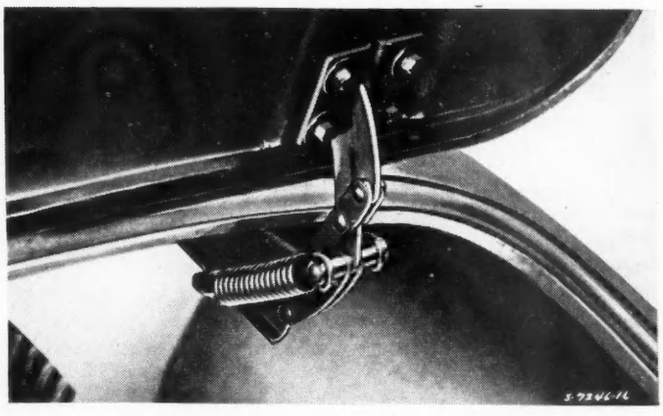
In deluxe-tone models the top halves of the bodies and belt panels are painted in lighter shades of the body colors. Five different deluxe-tone combinations are available, and nine "solid" paint choices.

Commanders and Presidents have more power and acceleration than last year. There has been no change in cylinder dimensions, the displacements remaining 226 and 250 cu. in., but compression ratios have been raised from 6.0 to 6.5 and the ratings have been increased to 94 hp. at 3600 r.p.m. for the Commander and 117 hp. at 3800 r.p.m. for the President. Both engines are of the L-head type, that of the Commander being a six and that of the President an eight.

On the President the water pump is now of the ball-bearing type, which is sealed for life. Water pumps are driven by V-belts, and both cooling systems have thermostatic control. Radiator cores now are of the tubular-cellular type. Support arms of the front independent suspension are now of forged steel and have widely spaced rubber-insulated mountings on the frame. Threaded pins are used on the outer ends of the control arms. Control links have been added this year. Both cars have steering gears of the cam-and-twin-lever type, and both have hydraulic service brakes with mechanical parking brakes operating on the rear wheels. Shock absorbers are double-acting hydraulic, with thermostatic control in the rear units. Metal spring covers are standard. Both cars have 18-gal. fuel tanks. Commander models carry 16 by 6.25 tires, as before, while the tire size on the President has been increased to 16 by 7.00.

The new cars are wider, and floors have been lowered 2⅞ in. at the front door and 2¼ in. at the rear door. Running boards have been entirely eliminated. Commanders and Presidents are being produced in two "slip-stream" body styles, a four-door sedan with a rear-quarter window, and the new four-door Land

(*Turn to page* 233, *please*)

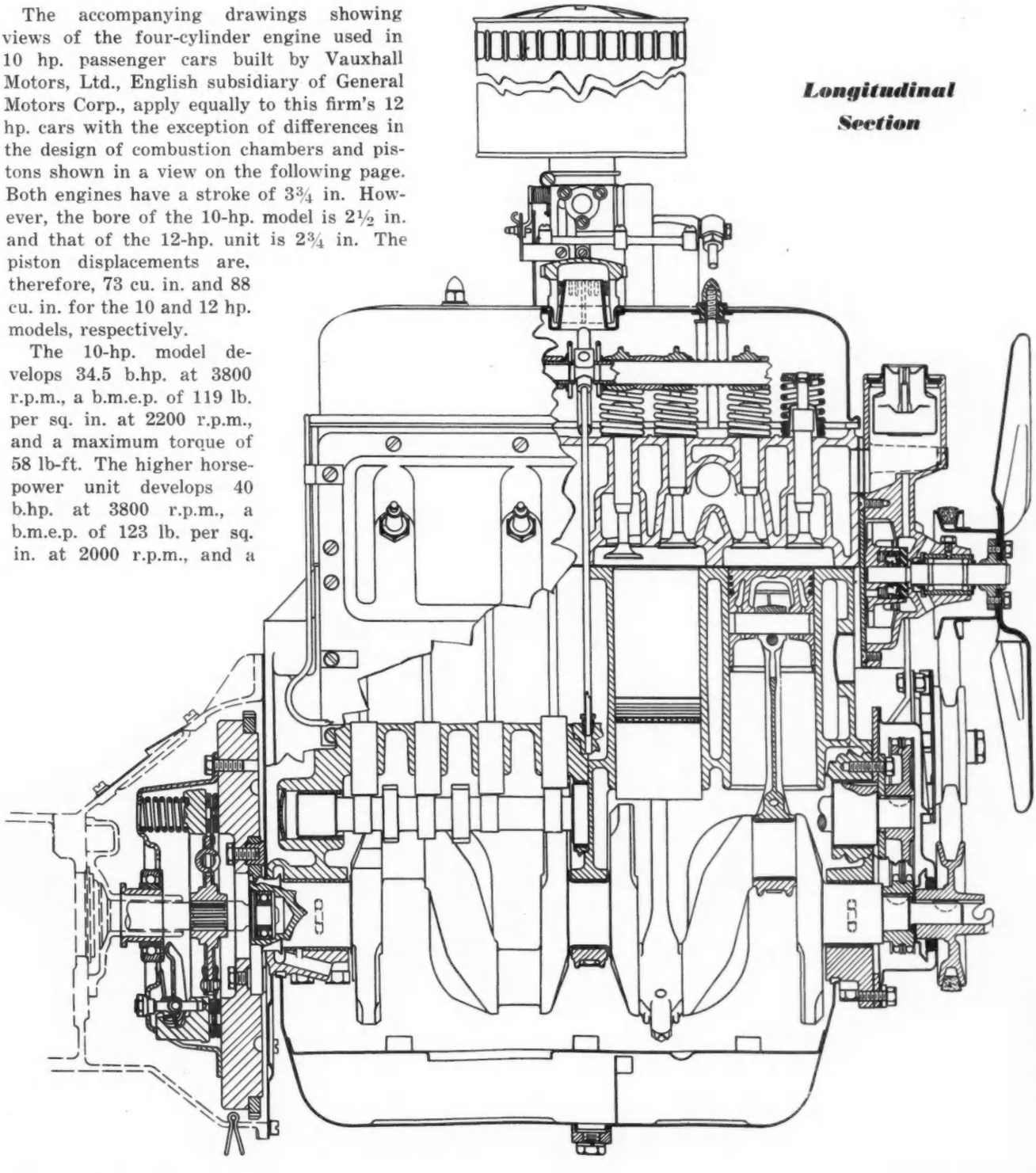


Concealed spring hinge for trunk lid which automatically holds the lid in the open position

VAUXHALL TEN and TWELVE FOUR-CYLINDER ENGINES

The accompanying drawings showing views of the four-cylinder engine used in 10 hp. passenger cars built by Vauxhall Motors, Ltd., English subsidiary of General Motors Corp., apply equally to this firm's 12 hp. cars with the exception of differences in the design of combustion chambers and pistons shown in a view on the following page. Both engines have a stroke of 3¾ in. However, the bore of the 10-hp. model is 2½ in. and that of the 12-hp. unit is 2¾ in. The piston displacements are, therefore, 73 cu. in. and 88 cu. in. for the 10 and 12 hp. models, respectively.

The 10-hp. model develops 34.5 b.hp. at 3800 r.p.m., a b.m.e.p. of 119 lb. per sq. in. at 2200 r.p.m., and a maximum torque of 58 lb-ft. The higher horsepower unit develops 40 b.hp. at 3800 r.p.m., a b.m.e.p. of 123 lb. per sq. in. at 2000 r.p.m., and a



Longitudinal Section

ENGINE DESIGN

VAUXHALL TEN and TWELVE FOUR-CYLINDER ENGINES

maximum torque of 72 lb.-ft. Compression ratio of the former is 6.5, while that of the latter is 6.8.

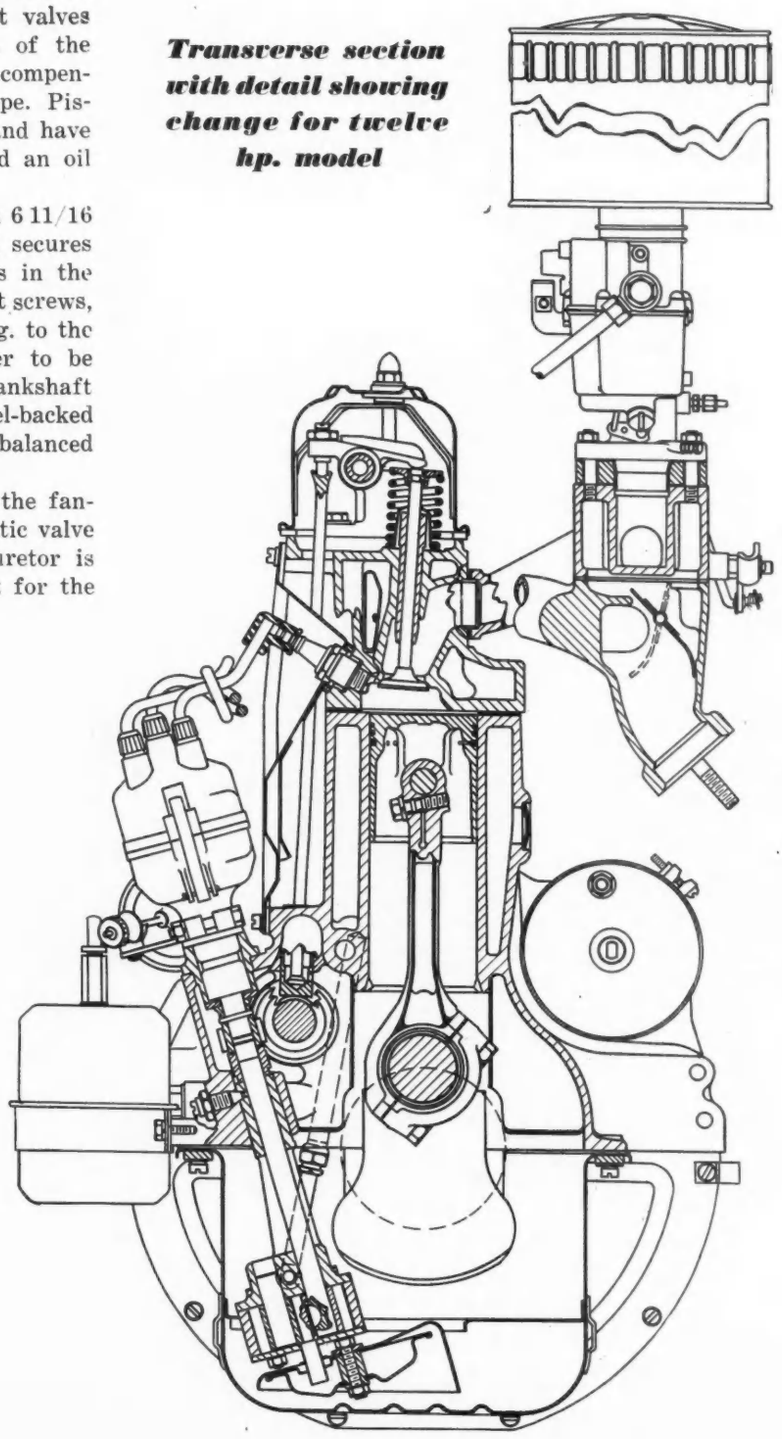
Inlet valves in both the Ten and Twelve have an effective diameter of 1 3/16 in. and exhaust valves 1 5/32 in. Silchrome steel is used. Valves of the Twelve are shorter than those of the Ten to compensate for difference in combustion chamber shape. Pistons in both engines are of aluminum alloy and have two individually cast high-pressure rings and an oil control ring.

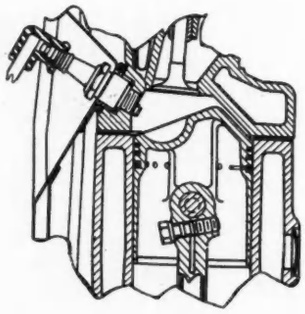
Connecting rods are of H-section steel with 6 11/16 in. centers. A clamp screw in the small-end secures the wrist pin, which floats without bushings in the piston bosses. The big-end cap is secured by set screws, and the rod end is split at an angle of 40 deg. to the axis of the rod, thereby enabling the latter to be withdrawn through the cylinder bore. Crankshaft journal bearings and big-end liners are of steel-backed white metal. The three-bearing counter-balanced crankshafts are identical in both engines.

Water circulation is by impeller pump on the fan-shaft, with temperature control by thermostatic valve without by-pass. A downdraft Zenith carburetor is used, with Vauxhall additions. Exhaust heat for the inlet manifold has thermostatic control. Ignition is by Lucas high-voltage coil and distributor with a spark plug gap of 0.037 to 0.040 in. The six-volt generator (belt-driven) is of the air-cooled and compensated voltage type. Ignition timing control is by both vacuum and centrifugal means and a micro-adjuster is provided.

Lubrication is by pressure throughout, except to the wrist pins. A spray feed direct to the cylinder walls at each revolution is effected through the holes drilled in the big-ends.

Transverse section with detail showing change for twelve hp. model





NEWS OF THE INDUSTRY

Chrysler to Build Tanks Under $53,500,000 Contract

Production on Order of 1000 25-Ton Tanks Is Expected to Be Underway in One Year

Calling for the construction of an estimated 1000 25-ton tanks, a $53,500,000 contract with the Chrysler Corp. has been cleared by the National Defense Advisory Commission for the War Department. The plant and equipment cost, included in the contract, is expected to be approximately $20,000,000. The Chrysler Corp. will build and equip the plant. The plant will have a floor area of 800,000 sq. ft. and will be erected on a 113-acre site in the Detroit area. Title will be transferred to the government. Production is expected to begin at the end of one year.

Under the arrangements made with the company, the government-owned plant will be leased at a nominal rental fee of $1 a year, operated and maintained by the company and used in the manufacture of tanks to be sold to the government at a fixed price. The plan, described as unique because it eliminates such controversial tax questions as amortization on depreciation allowances, provides not only for the government compensation for the cost of the plant, but also for the payment of a four per cent commission.

"The plant will embody the most modern practice in tool and machinery design, in lay-out and in plant and production engineering," the War Department said. "It will also be readily adapted to expansion. Thus, the government will be in a position not only to produce tanks in large numbers but also to have a new tank arsenal in which the art of tank building may be continuously developed."

Negotiations which led up to this contract were begun about 10 weeks ago. At that time William S. Knudsen, head of the defense commission's production division, requested K. T. Keller, president of Chrysler Corp., to make a study of tank production. Mr. Keller and a group of engineering and production executives immediately went to Rock Island Arsenal to inspect the construction of tanks at that place. Some 200 of the corporation's design, tool, machinery and production engineers devoted their entire time to figuring on the project in detail.

Acme

License No. 1

Orville Wright, surviving brother of the two-man team that pioneered aviation in the United States, displays the Honorary Aircraft Pilot Certificate, No. 1, which was presented to him during ceremonies held at the unveiling of a monument to the Wright brothers at Dayton, Ohio, on Aug. 20.

RFC Forms Two New Corporations As Defense Aid

The Reconstruction Finance Corp. is creating two additional corporations, the Defense Plant Corp. and the Defense Supplies Corp., each with a capital of $5,000,000, to aid the Defense Commission and the War and Navy Departments in the defense program.

The Defense Plant Corp., said Federal Loan Administrator Jesse Jones, is necessary in some instances in connection with plants, equipment and machinery, particularly for the manufacture of airplanes, airplane engines and airplane parts.

The Defense Supplies Corp. has been allocated $50,000,000 to acquire for storage at strategic points throughout the country a substantial supply of high-test gasoline for the War and Navy Air Services. No specific sum has yet been set aside for use by the Defense Plant Corp.

Stanley P. Rockwell

Stanley P. Rockwell, renowned metallurgist and inventor of the Rockwell Hardness Tester, died Aug. 11 as the result of an explosion on his yacht at Middletown, Conn. Mr. Rockwell invented the Rockwell Hardness Tester while in the Employ of New Departure, Division General Motors Sales Corp., from 1912 to 1916. He was honored in 1939 by the Sauveur medal from the American Society for Metals.

Steel Mills Booking Fourth Quarter Automobile Business

Average Cost of Steel in Initial '41 Models Will Be Slightly Below Current Quotations

Booking by steel mills of fourth quarter business from automobile manufacturers has gotten under way. Under present conditions, protection against delays in shipments is considered by buyers of paramount importance. There is little justification at this stage of developments for conjuring up a steel famine, and no one is more active in seeking to allay uneasiness on that score than are the steel producers themselves, but they do suggest to consumers the wisdom of anticipating their requirements as far ahead as possible, and the purchasing agents of automobile companies are cooperating with them as much as they can.

The state of the steel market being what it is, it is assumed that new business carries full prices. Some buyers, however, still have lower-priced steel coming to them, and, what with some reserve stocks, average cost per pound of steel in initial 1941 model assemblies will still be slightly below current quotations. No one can forecast at this time what the first quarter 1941 steel price set-up will be, and some mills are said to have declined to quote binding prices for that term. Non-integrated flat steel rollers are pressing their suppliers of primary steel to speed up deliveries, but so far raw steel output seems to be keeping pace with the needs of finishing divisions.

At a time like this, it is well to remember that the yardstick of weekly ingot operations is a relative one. Even now one hears of this or that mill operating at a few points over 100 per cent of capacity, although the American Iron & Steel Institute recently estimated the rate of employed ingot capacity for the industry as a whole at 89.7 per cent. Last winter a rate exceeding 94 per cent was attained at one time. Makers of hot rolled bars report a marked increase in automotive buying in the last few weeks.

Greatly increased consumption of magnesium is looked for as the result of a reduction in the price of this lightest of commercial metals to 27 cents a pound.

Lower tin prices have not brought out much business, the market being flat. Spot Straits tin was offered recently at 50¾ cents a pound. Reports that the Netherlands East Indies have begun applying a 5 per cent ad valorem export duty to tin are puzzling to the trade here. The Netherlands East Indies government owns one of the two large producing companies outright and has a major interest in the other, so that such an export tax would be a case of taking money out of one of the government's pockets and putting it in the other. Progress is reported in the negotiations for the construction of a tin smelter in the United States.

An advance in the price of zinc by $5 a ton and firmer copper prices have imparted a strong undertone to the market for automotive brasses. Spot electrolytic copper is held at 10⅞ to 11 cents.—W.C.H.

GM's Cleveland Diesel Engine Division Expands

Construction of two additions to present buildings by the Cleveland Diesel Engine Division of General Motors Corp., Cleveland, Ohio, will be started soon to provide room for increased production. The additions will total 37,650 sq. ft. of floor space.

Circuit Court Affirms FTC Six Per Cent Case Ruling

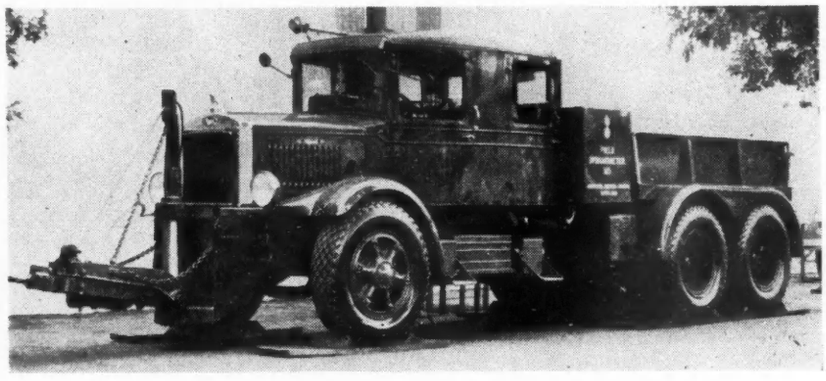
By a unanimous decision the United States Circuit Court of Appeals for the Second Circuit (New York) has affirmed a Federal Trade Commission cease and desist order against the General Motors Corp., the General Motors Sales Corp. and the General Motors Acceptance Corp., on the six per cent plan of deferred or installment payments for automobiles. The commission alleged that the six per cent plan was misleading and ordered that GMAC advertising be changed to make it clear that since the plan does not provide for amortization of the balance due it is not a simple six per cent interest charge. The court also held that the commission has jurisdiction in the case.

The court decision, delivered by Judge Augustus N. Hand, said in part:

"It may be that there was no intention to mislead and that only the careless or the incompetent could be misled. But if the commission having discretion to deal with these matters thinks it best to insist upon a form of advertising clear enough so that, in the words of the prophet Isaiah, 'wayfaring men, though fools, shall not err therein,' it is not for the courts to revise their judgment.

United Aircraft Expands Further

Further expansion of the United Aircraft plants in East Hartford and Stratford at an estimated cost of close to $15,000,000 has been announced. Plans call for another large addition to the Pratt & Whitney Aircraft engine factory in East Hartford, which will bring its total floor area to approximately 1,500,000 sq. ft., the addition of another bay running the entire length of the Hamilton Standard Propellers factory in East Hartford; and approximately doubling the area of the Vought-Sikorsky Aircraft factory at Stratford.



Field Dynamometer for U. S. Army

Mack Trucks, Inc., built this field dynamometer unit for the U. S. Army. The model FK six-wheel truck will be used to measure draw bar pull, speed, fuel consumption and rolling resistance. This is done by means of hydraulic bars mounted on the front and rear of the vehicle. Each draw bar consists of a piston arrangement which is connected hydraulically to a recorder mounted in the cab. When the truck is being used as a dynamometer truck or to measure draw bar pull of another truck, resistance is developed in the dynamometer unit by means of a constant displacement pump which is driven through the rear axle. This pump circulates water from a 350 gal. tank mounted in back of the cab. Pump pressure can be varied by a hand valve. Maximum draw bar pull which can be measured is approximately 25,000 lb. at two m.p.h.

CENSORED

An exclusive feature prepared by the London correspondent of AUTOMOTIVE INDUSTRIES, M. W. Bourdon.

Despite all the activities of Government, Press and equipment makers in endeavours to popularize the use of producer gas, only 605 gasoline trucks and buses were converted to its use during the nine months ended June 30 last.

* * *

For the first time in a great many years the number of new motor cycles registered exceeded the total of new cars in June. The actual figures were: Motor cycles 3043 and cars 1891; the latter represents a decrease of 92.9 per cent in June last year and the former a drop of 41 per cent. Truck registrations fell by 74.8 per cent to 1353 and buses by 69.6 per cent to 286.

* * *

Several truck manufacturers have opened "priority lists" for deliveries of post-war models.

* * *

The repair and reconditioning of military transport vehicles is being done by selected garages in many parts of the country, not by manufacturers except where the latter have service depots and repair work will not hamper the production of new vehicles.

* * *

It has been made an offence to sell or buy a new truck or bus without a permit from the Ministry of Supply; this applies to chassis and complete vehicles in the hands of either dealers or manufacturers. A permit will not be granted unless the new vehicle is required for "civilian work of the utmost importance."

* * *

In a bulletin referring to the use of oil engines in road vehicles, the Diesel Engine Users' Association (London) states that experimental work in developing the high-speed two-stroke cycle type of engine gives rise to expectation that such an engine will be adopted for the lighter varieties of trucks, possibly with supercharging.

* * *

The Minister of Supply has put into force an order entirely prohibiting the use of tin plate and sheet for the manufacture of containers for certain commodities. In other cases a minimum size is specified; thus metal containers for grease must hold at least 28 lb., those for shock absorber oil and brake fluid at least two pints and those for lubricating not less than 10 gal.

Check-Up

William S. Knudsen, head of the Industrial Defense Production Board, and Major General Henry H. Arnold, chief of the Army Air Corps, shown in the plant of the Vultee Aircraft factory at Los Angeles, Calif., which they visited on a recent tour of airplane manufacturing plants throughout the nation.

International

Japanese Automobile Makers Beginning to Show Profits

Cabinet Bureau of Statistics Reports Heavy Increases in Employment with the Machine-Tool Industry Heading the List

Automobile manufacture in Japan is beginning to return profits. For the first business term this year, Toyota realized 16.7 per cent against paid-up capital, as compared with 5.1 per cent for the corresponding period last year. The dividend was six per cent on each share of Y50.

The Cabinet Bureau of Statistics has disclosed that employment in the vehicle and ship building industries has increased 60 per cent since the outbreak of the "incident" three years ago, and in the machine-tool industry as much as 102 per cent. Employment in these two groupings now reaches 900,000.

The machinery industry has become Japan's largest manufacturing industry, at least in point of capital investment, it was recently revealed by the Bank of Japan. At the end of March, investments totaled Y2,978 million, only Y43 million less than the aggregate working capital of the chemical industry, which for several years has held the top position. New expansion projects have meanwhile jerked the machinery industry to the top.

Exports of cars and chassis during the first four months, mostly to Manchuria and China, reached a number of 1452, as compared with 945 during the corresponding period last year. Exports of parts, including tires, reached a value of Y12.6 million, vs. Y7.1 million last year.

Japanese automobile exporters hope to make some hay in the new "inspectorate," French Indo-China, as long as the sun of the European war shines, even though they have not been able to pick up much business in the Dutch East India.

Talk of American investments in automotive and other industrial enterprises in Manchukuo and China bobbed up again as a fact-finding mission from the U. S., headed by Major-General John F. O'Ryan, began a series of discussions with Japanese business and government leaders.

The party includes two investment experts, Warren Seabury Hunsberger, economist of Princeton University, and Simon Whitney, investment adviser to Lionel Edie & Co., New York City investment brokers.

The findings of the mission will be summarized in a confidential report available to members of an investigation pool headed by Dillon, Read & Co.

The major-general and his two aides explained to AUTOMOTIVE INDUSTRIES' Tokyo correspondent that the investment opportunities offered will be assessed strictly on their merits, and that there is no political motive behind the investigation.

Meanwhile, rumors are cropping up in Japan's industrial press that Ford Motor Co. (Japan) Ltd. has ultimately decided to wind up its affairs in Nippon because there is not enough business to keep its Yokohama assembly plant going. Equipment may be moved to Manila, or Hanoi, French Indo-China.

July Rim Inspections 21% Over 1939 Mark

The total number of rims inspected and branded during July by the Tire & Rim Association amounted to 825,089, an increase of approximately 21 per cent over July, 1939. During the first seven months of 1940, the Association approved and branded 11,590,199 rims, an increase of approximately 26 per cent over the similar period in 1939.

In the month of June the Association inspected and branded 1,266,300 rims, an increase of approximately 14.5 per cent over June, 1939.

Walter P. Chrysler

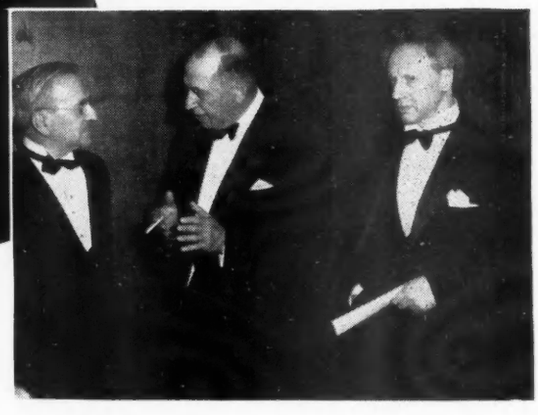
1875-1940

WALTER P. CHRYSLER, his name brilliantly and indelibly associated with the development of the automobile, died on Aug. 18. Mr. Chrysler's fabulous career ran the Horatio Alger gamut from a wiper in a railroad roundhouse at five cents an hour to one of the biggest jobs in the industral world at a salary of $1,000,000 a year. He was 65 years old when he succumbed to the cerebral hemorrhage that ended two years' of illness.

Born April 2, 1875, at Wamego, Kans., Chrysler was educated at the High School of Ellis, Kan., and a business college in Salt Lake City. His first job was with the Union Pacific

(*Continued on next page*)

Highlights: (Left), Mr. Chrysler; (Below, left), Attired in cap and gown, he congratulates two graduates at the fourth annual commencement exercises of the Chrysler Institute of Engineering; (Below, right), Major Bowes shows his sponsor one of his trophies exhibited at the International Automobile Salon in the Chrysler Building, New York City; (Bottom, left), The boss and some of the boys celebrate a new production record at the Plymouth factory; (Bottom, right), Albert Kahn, noted architect, Mr. Chrysler and Ossip Gabrilowitsch, conductor of the Detroit Symphony Orchestra.



Railway. Four years of apprenticeship with this organization were followed by successive occupations of journeyman, machinist, roundhouse foreman, general foreman and master mechanic. At the age of 33 he became superintendent of the Chicago Great Western Railway Co. Not content with this position he left to join the Pittsburgh Works of the American Locomotive Co. as manager.

About this time Mr. Chrysler made what probably was one of the most momentous decisions in his life. Here is the story in his own words: "I went over to Chicago to see the automobile show. I saw a Locomobile touring car. It was painted ivory white and the cushions and trim were red. The top was khaki, supported on wooden bows. Straps ran from that top to anchorages on either side of the hood. On the running board there was a handsome tool box that my fingers itched to open.

"The price tag meant just what it said, as I found out by repeated inquiries: $5,000 cash. I had $700. . . . All I asked myself was: 'Where can I raise the money?'"

Fast and hard talking induced Ralph Van Vechten, second vice-president of the Continental National Bank, to produce the needed funds and the car was shipped to Chrysler. But he didn't drive it! Instead, for three solid months he spent all his spare time taking that car apart and putting it together again.

In 1911, James J. Storrow, head of Lee, Higginson & Co., bankers, and a director of the American Locomotive Co., wired Chrysler that he wanted to see him in New York. As a result of their conference, Chrysler joined the Buick Motor Co. as works manager of the plant in Flint, Mich., where 15 to 45 cars a day were being produced. Eight years later an average of 560 Buicks were being turned out daily and $48,000,000 was being poured annually into the treasury of the General Motors Corp. from this concern. During the World War, as head of Buick, he directed the building and equipping of factories for the quantity production of Liberty engines. He remained with the company as president and general manager, and first vice-president of GM until Nov. 1, 1919, when he left with the intention of retiring. He wasn't idle very long.

A committee of bankers representing the Willys-Overland Co. asked Chrysler to take over management of the company at least until they could recover the $50,000,000 they had loaned to it. He got $1,000,000 a year for this job, and also was asked to reorganize the Maxwell Co. His work with Willys was finished in 1922, the bankers having arranged for a $16,500,000 bond issue to retire the loan and the company was being put through receivership.

Now he had time to realize his dream, a "Chrysler" car. Gathering about him three men whom he had met while struggling with the Willys plant, Fred M. Zeder, Owen R. Skelton and Carl Breer, Chrysler showed the public his new car at a private showing at the Commodore Hotel in New York City in 1924. At the 1925 New York Show the Chrysler six appeared on the floor. In the one year between shows, 32,000 Chrysler sixes had been sold, and Maxwell fours had shown a sharp gain. That same year, Maxwell Motor Corp. became the Chrysler Corp. By 1927 the corporation had advanced to fifth place in the automobile industry. Things were moving fast. One year later Chrysler purchased the Dodge Corp. for a cool $170,000,000, and the corporation that bore his name was in debt for $60,000,000. When 1937 rolled around Chrysler Corp. didn't owe one cent.

Among many honors conferred on Walter Percy Chrysler, Sr., was the honorary degree of Doctor of Engineering awarded by the University of Michigan. The citation simply and briefly praised him for having "dealt sympathetically and effectively with the complex problem of labor," for his "courageous policy of engineering research and plant improvement during a period of diminishing returns," and concluded with the truism that "Through perseverance, vision and ability he has won for himself and the company he represents an important place in one of the great industries of the world."

Ourselves & Government

A Check List of Federal Action Corrected to Aug. 27

FEDERAL TRADE COMMISSION

GM EXCLUSIVE DEALER CASE—Commission filed reply brief on Aug. 15 charging that respondent's brief has misinterpreted and misconstrued issues. Next step will be arguments.

F.O.B. PRICE CASE—Commission has not set date for resuming testimony in GM and Ford proceedings.

United States Circuit Court of Appeals has affirmed Commission's cease and desist orders in General Motors' 6 per cent case. (See page 220.)

DEPARTMENT OF COMMERCE

The Department's Automotive-Aeronautics Trade Division has been changed to the Motive Products Division.

Ford Gets P&W License Offer

Following a meeting with officials of the Ford Motor Co., Frederick B. Rentschler, chairman of United Aircraft Corp., announced that a license agreement had been offered to the Ford company for manufacture of the Pratt & Whitney Double Wasp engine under a contract now being negotiated with the U. S. government, and that a "substantial meeting of minds" had resulted. Mr. Rentschler pointed out that despite the heavy development costs incurred by Pratt & Whitney Aircraft during a three-year development period for this engine, the license agreement would call for a nominal license fee of only $1 per engine to be paid by Ford to Pratt & Whitney Aircraft.

Approximately 15 representatives of the Ford company, headed by Edsel Ford, president, Charles Sorensen, general manager, and A. M. Wibel, director of purchasing, together with George J. Mead, director of the Plane and Engine division of the National Defense Advisory Committee, inspected the Pratt & Whitney Aircraft factory.

Goodyear Building New Synthetic Rubber Plant

Immediate expansion of facilities for the manufacture of its synthetic rubber, Chemigum, has been announced by the Goodyear Tire & Rubber Co. The new plant, with an initial capacity of 10,000 lb. per day, will be installed at Akron, Ohio, in space which has been made available within the company's existing buildings. Chemigum is derived from petroleum, through a cracking process, and is the culmination of work by Dr. R. P. Dinsmore, in charge of all development and research, and Dr. L. B. Sebrell, manager of chemical research for Goodyear. Tires of the newly announced chemical rubber are said to give superior performance to those made of German Buna, and equal to those made of natural rubber.

Requisitioning of Machine Tools Gets House Approval

The House on Aug. 22 passed the Faddis-Hill bill authorizing the President to requisition machine tools and other essential national defense materials which have been ordered in this country by foreign countries but are held at docks or in the hands of the manufacturers.

40 YEARS AGO

Not long ago the French Academy decided that, contrary to usage, the word "automobile" is masculine. It now appears that this decision was reached by seven academicians only. Three voted for feminine, while the rest of the learned assembly happened to be sojourning in the country.

Let us, then, remarks a French contemporary, quietly say "one automobile," at the risk of never becoming academicians.

From *The Horseless Age*, September, 1900.

RFC Loan of $34,000,000 To Curtiss-Wright Corp.

Will Erect and Equip Plants for Building Aircraft At Buffalo, N. Y., Columbus, Ohio, and St. Louis

For the purpose of acquiring plant sites and erecting and equipping plants for the manufacture of airplanes at Buffalo, N. Y., Columbus, Ohio, and St. Louis, the Reconstruction Finance Corp. has made a loan of $34,000,000 to the Curtiss-Wright Corp. The RFC also has agreed to lend the corporation up to $15,000,000 for labor and materials and other necessary expenses in manufacturing the airplanes. Federal Loan Administrator Jesse Jones, in making this announcement, said that the RFC has further agreed to lend to responsible cooperating companies up to $2,160,000 for the purchase of machinery and equipment and other facilities to produce necessary parts for construction of the planes.

"The commitments were authorized in contemplation of the Curtiss-Wright Corp. providing additional plant capacity and facilities satisfactory to the War and Navy Departments and securing orders from the United States Government for at least 3791 airplanes, with an option running to the government for a like number of additional planes," said Mr. Jones.

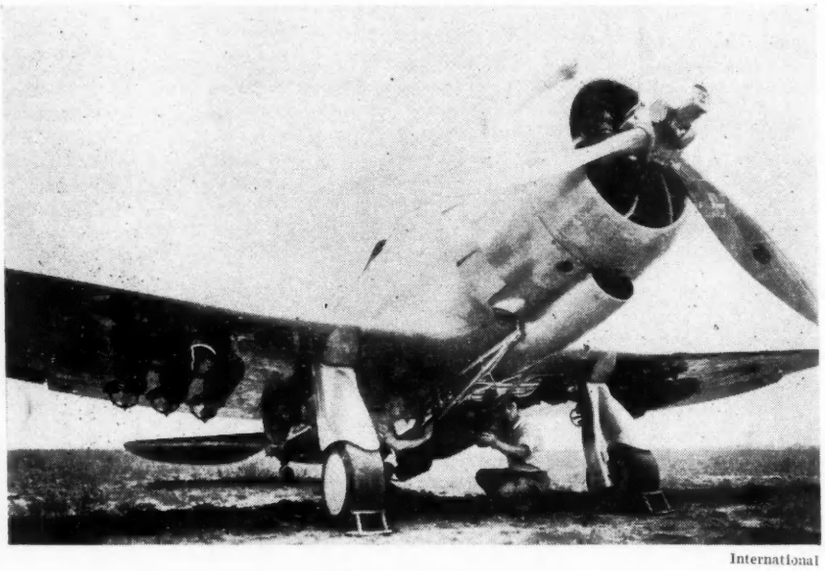
Loans of $10,500,000 to the Boeing Aircraft Co. and $17,000,000 to Bendix Aviation Corp., maker of airplane parts, also were made for new plant construction, expansion and equipment. RFC Chairman Emil Schram said that Boeing plant expansion at Seattle, Wash., will involve $7,000,000 or $8,000,000 and at Wichita, Kan., $2,500,000 to $3,000,000.

The newly organized Defense Plant Corp., Mr. Jones said, probably will handle the financing, involving $8,000,000, of equipment that the Packard Motor Car Co. will require in connection with its contract for the construction of 9000 Rolls-Royce airplane engines, 3000 for the United States and 6000 for Great Britain. The defense corporation also, Mr. Jones, explained, may supply about $20,000,000 of the total of $92,000,000 that has been loaned to the Wright Aeronautical Corp. The former sum had been reserved for "cooperating companies."

Mr. Jones said that the Army and Navy eventually will take the reserve stocks of 100 octane aviation gasoline being stored by the newly created Defense Supplies Corp. at a price which would pay the corporation for its expenditures and carrying expenses.

Federal-Mogul Shows Six Months' Profit

A recent report of the Federal-Mogul Corp., Detroit, Mich., shows that a net profit of $361,668.55 was earned in the first six months of 1940. This is equal to $1.29 per share, an increase of over 26 per cent compared with the first six months of 1939.



International

Three In One

The "Guardsman," fast and heavily-armed fighting plane, can be used as a regular bomber, a dive bomber or as a pursuit interceptor. As a bomber it carries a load of 1350 lb. of bombs. It has a speed "well over 300 m.p.h.". Republic Aviation Corp. is producing this plane at its plant in Farmingdale, N. Y.

MEN . . . . . .

John P. Davey, chief of production planning at the Curtiss Aeroplane Division of Curtiss-Wright Corporation in Buffalo, N. Y., has been transferred to the company's plant in St. Louis to develop expanding operations there. Mr. Davey will be assistant factory superintendent in St. Louis.

Daniel J. Rohyans has been named assistant sales manager of the Studebaker Corp. in South Bend, Ind.

S. C. Merrill has been appointed assistant general sales manager of the automotive division of the Timken Roller Bearing Co., with headquarters in Detroit.

D. N. Larson and **L. D. Schwartz** have been appointed special sales assistants to August Johnson, executive vice-president of the Graham-Paige Motors Corp. Mr. Larson will serve as assistant to Johnson in the territory west of the Mississippi River, while Mr. Schwartz will serve in a similar capacity in the East. **F. N. Fincke**, district manager at Indianapolis, has been shifted to a similar post in New York, while **A. H. McConnell** has been transferred from the Dallas district to Pittsburgh.

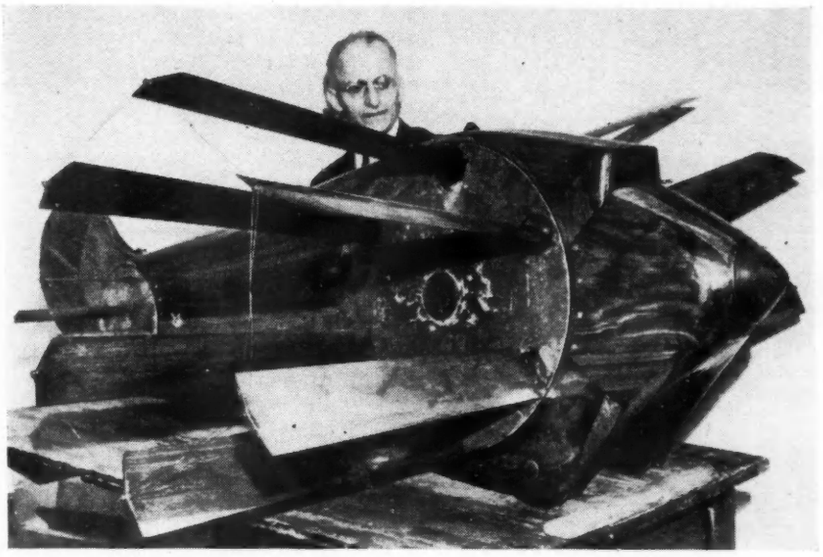
J. B. Baumann, formerly on the engineering staff of Taylorcraft Co., Alliance, Ohio, airplane manufacturers, has been elected the first president of the Mercury Aircraft Co., Inc., Menominee, Mich., by directors of the company that recently located in the Michigan city. Other officers elected are **Frank L. Betts,** vice-president in charge of sales; **Richard D. Smith,** vice-president and general manager; **W. W. Rittamel,** secretary-treasurer. The Mercury company will manufacture two types of planes at its Menominee plant, a four-place cabin job, selling at under $5000, and a two-place trainer. President Baumann will also be plane designer and chief engineer for the new company.

Harold J. Dawe, Ph. D. in Chemistry, University of Michigan, 1940, has been added to research staff of the Acheson Colloids Corp., Port Huron, Mich.

Dave Neill has been appointed factory service manager of the Automobile Division, The Crosley Corp.

Kendrick B. Brown, president of the Chrysler Illinois Co., has been appointed president of the Chrysler Detroit Co., Detroit factory branch. He succeeds **Joseph A. O'Malley**, who takes over an executive position in the factory.

Harold Caminez has been appointed executive engineer of Air Associates, Inc. Mr. Caminez was connected with



Acme

Something New in Bombers

Professor F. K. Kirsten of the University of Washington Aeronautical Department is shown with a scale model of a new type of bomber in which he is trying to interest military authorities. Cycloidal propellers extending from the side of the plane in lieu of wings would, it is claimed, give the plane a speed of 500 m.p.h. Smaller propellers of the same type would guide the plane from the rear.

"No Changes" in Top Personnel at Willys

Ward M. Canaday, chairman of the board, Willys-Overland Motors, Inc., issued the statement recently that "No changes whatever are contemplated in the executive management of this company."

Chrysler to Offer Fluid Drive on Dodge and DeSoto

Fluid drive, which heretofore has been available only on higher-priced cars in the Chrysler line, will be optional equipment on the 1941 Dodge, DeSoto and lower-priced Chrysler passenger cars.

Charles W. Matheson

Charles W. Matheson, prominent as an automobile sales executive for 20 years, was killed Aug. 12 in an automobile accident near Broadhead, Wis. In recent years he had been doing special sales organization work for the Graham-Paige Motors Corp. He was 63 years old.

Allison Engineering Co. of Indianapolis from 1929 to 1936 where he worked on the design and development of the V-1710 Allison engine. He also originated the "Aero-Thread" screw thread system which was introduced recently by Air Associates, Inc.

Howard M. Hubbard has succeeded **D. G. Millar** as president of the Greenfield Tap & Die Corp., Greenfield, Mass. Mr. Millar is now chairman of the board, replacing **Col. Frederick H. Payne**, who resigned to devote his entire time to national defense as chief of the Hartford Ordnance District.

The creation of a fleet maintenance division has been announced by Frank A. Nealon, sales manager of the merchandising division of Electric Auto-Lite Co. **Carroll A. McShane** has been appointed to the post of fleet maintenance engineer.

William L. Batt, president of S.K.F. Industries, has been appointed as deputy commissioner of the Industrial Materials Division of the National Defense Advisory Commission. Mr. Batt has been with the National Defense Advisory Commission since it was organized as division executive in charge of mining and mineral products for the Industrial Materials Division.

Col. Fred Glover has resigned as president and director of Reo Motors, Inc. **W. C. Woods** has been elected vice-president.

William T. Barton has been appointed purchasing agent of the American Bosch Corp., Springfield, Mass.

A. Oakleigh Bush has been appointed assistant chief sales engineer of the abrasive division of Norton Co., Worcester, Mass.

Business in Brief

***Written by the Guaranty Trust Co., New York, Exclusively for* AUTOMOTIVE INDUSTRIES**

The seasonally adjusted index of The New York *Times* for the week ended Aug. 10 rose to 101.9 per cent of the estimated normal, four fractional points above the level a week earlier. The index of *The Journal of Commerce*, without seasonal adjustment, advanced a full point to stand at 104.9 per cent of the 1927-29 average, a new 1940 peak, as against 90.4 a year ago. The Federal Reserve newly revised adjusted index of industrial production for July stands at a preliminary figure of 121 per cent of the 1935-39 average, the same as for June but 17 points above the figure for July, 1939.

With retail trade well maintained during the week ended Aug. 17, regional averages ranged, according to Dun & Bradstreet estimates, from 6 to 10 per cent above corresponding 1939 levels; wholesale business was somewhat retarded. Department store sales during the preceding week were 8 per cent above the comparable 1939 total, according to the Federal Reserve compilation.

Production of electricity by the light and power industry during the week ended Aug. 10, reflecting more comfortable weather conditions, fell moderately below the year's record output in the preceding week—the excess above corresponding figures last year receding to 11 per cent from 12 per cent.

The number of railway freight cars loaded in the same period, 726,926, was 1.2 per cent above that for the week before and 10 per cent above the comparable 1939 figure.

Bank debits to other than inter-bank accounts in leading cities during the week ended Aug. 7 were substantially above the total for the preceding week; for the thirteen-week period then ended the aggregate was four per cent more than the corresponding amount last year.

Crude oil production during the week ended Aug. 10 declined slightly to an average of 3,475,200 barrels daily and was 182,400 barrels less than the required output as computed by the Bureau of Mines; a similar margin of 134,850 barrels was reported for the week before.

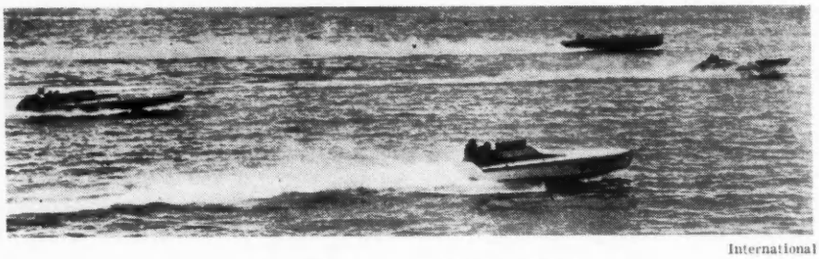
Engineering construction contracts awarded during the fortnight ended Aug. 15 declined sharply from previous high levels that reflected unusual defense preparations, and the cumulative 1940 total stands only one per cent above the corresponding amount in 1939, according to *Engineering News-Record*.

Cotton-mill activity increased less than seasonally in the week ended Aug. 10. The New York *Times* adjusted index, accordingly, declined to 127.6 from 129.9 for the preceding week, as compared with 125.4 a year ago.

Life insurance put in force during July by 40 major companies was 19.5 per cent more than the comparable amount last year; for seven months this year the corresponding gain was 1.2 per cent.

Professor Fisher's index of wholesale commodity prices last week advanced one fractional point from the year's low level to 81.1 per cent of the 1926 average.

Excess reserves of the member banks of the Federal Reserve system rose $60,000,000 during the week ended Aug. 14, replacing the sharp downward trend of the preceding three weeks; the estimated total on that date was $6,390,000,000.



International

The Winner—Hotsy-Totsy

This picture was taken during the first of three 33-mile heats of the Gold Cup race for the championship of the speed boat world held recently on the 2½-mi. harbor course at Northport, N. Y. Hotsy-Totsy won this and the second heat to score an upset victory for its novice owner-pilot, Sidney Allen.

Defense Commission Offers Plan to Expedite Contracts

Contractors Would Finance Expanded Facilities Through Use Of Own Funds or the Granting of Credit from Private Sources

Increasingly concerned over delay in the defense program, the National Defense Advisory Commission has announced a plan which would permit contractors to finance expanded facilities through the use of their own funds or the granting of credit from private sources. The program was partly inspired by the delay in Congress in passing the excess profits tax-amortization legislation. The bill aside from its tax feature would remove the Vinson-Trammell Act profit limitation and allow tax deductions from expanded plant costs over a five-year period. The commission also is anxious for passage of the $5,000,000,000 defense appropriation bill so that contracts for equipment may be placed.

The commission plan was prepared by its committee on taxation and finance, headed by John D. Biggers. It offers bankable contracts for private financing and at the same time, it was pointed out, it would safeguard the government's interest in the facilities. The bankable contract was described as representing "striking progress" in the evolution of government procurement methods, and Mr. Biggers said he hoped it would accelerate the use of private funds. But he added, unless Congress passes the pending legislation the plan will be "one-legged."

Specifically, it was stated, the plan has two purposes: First, to expedite the signing of supplies contracts by assuring the contractor against loss on construction undertaken for military purposes; second, it safeguards the government's interest in such facilities on termination or completion of the contract. The government's residual interest upon termination of the contract would be evaluated by the usual board of three appraisers, one appointed by the government, one by the contractor and the third by the senior judge of the Circuit Court of Appeals of the circuit where the facilities are located. The decision of any two appraisers would be controlling, but if no two agree, the decision of the third appraiser would be final.

The government would reimburse the contractor, not in additions to the unit price of the product purchased as heretofore, but in five equal annual installments covering the amount of his capital expansion costs as audited by approved certified accountants. By this means the cost of supplies and amortization by the government of construction cost would be separated.

"Upon passage of the defense appropriation bill, tax and amortization legislation now being considered by Congress, contracts involving the major procurement program can be placed with all the speed consistent with systematic and orderly purchasing," the commission committee said.

"Adoption of this plan assures that neither the private manufacturer nor the government would assume in advance all the risk, nor subsequently reap as a profit the residual value. Should the manufacturer be unable to use the property at the final determined valuation, the government would then take title, use the property for its own needs, hold it for emergency reserve capacity, sell it, or dismantle and salvage.

"It is expected that the plan will conserve government funds and stimulate investment of private capital in the defense construction program. At the same time, private manufacturers would provide management and operation and assume all the ordinary risks of the business. Government participation would be limited to actual expansion costs. Final adjustment of fair value would reimburse the government to the extent of the residual value of the property."

Leon Henderson, a member of the

Six-Months' Automotive Exports and Imports

	JUNE 1940		JUNE 1939		SIX MONTHS ENDED JUNE 1940		SIX MONTHS ENDED JUNE 1939	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		$ 17,660,844		$ 20,386,503		$ 135,133,033		$ 144,255,904
PASSENGER CARS								
Passenger cars and chassis	6,309	3,933,814	10,391	6,390,286	57,319	35,616,907	89,716	55,185,799
Low price range $850 inclusive	5,746	3,283,344	9,368	5,293,615	50,738	28,733,454	79,897	44,825,507
Medium price range over $850 to $1,200	476	457,765	860	817,317	5,690	5,414,715	8,45	8,068,825
$1,200 to $2,000	56	83,472	135	195,349	783	1,138,113	1,129	1,675,729
Over $2,000	31	109,233	28	84,005	108	330,625	234	615,738
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (tot l)	8,094	6,538,331	10,976	6,573,325	58,544	47,733,208	64,595	39,724,951
Under one ton	825	374,386	1,593	650,608	7,774	3,533	9,768	4,121,158
One and up to 1½ tons	6,376	3,345,40	7,642	4,237,744	38,145	20,823,979	44,827	24,430,415
Over 1½ tons to 2½ tons	453	433,239	1,413	1,182,277	8,542	11,137,314	7,136	6,129,264
Over 2½ tons	422	2,368,190	244	439,295	3,959	12,059,386	2,396	4,652,518
Bus chassis	18	17,115	84	63,401	124	178,725	458	391,596
PARTS, ETC.								
Parts except engines and tires								
Automobile unit assembly		3,245,090		2,505,197		23,014,572		21,401,244
Automobile parts for replacement (n.e.s.)		2,653,492		3,690,148		21,585,070		19,787,509
Other automobile accessories (n.e.s.)		364,458		311,485		2,345,099		1,919,080
Automobile service appliances	703	326,736	1,434	568,452	5,266	2,085,522	10,052	3,179,308
Airplanes, seaplanes and other aircraft	372	20,320,793	150	6,524,289	1,462	91,877,028	733	30,612,371
Parts of airplanes, except engines and tires		27,591,288		10,619,563		138,388,046		48,869,615
INTERNAL COMBUSTION ENGINES								
Stationary and Portable								
Diesel and semi-Diesel	103	439,779	50	204,100	492	1,719,256	240	972,392
Other stationary and portable								
Not over 10 hp.	1,661	92,840	931	51,655	8,218	473,409	6,583	386,441
Over 10 hp.	143	530,392	262	111,369	1,200	1,893,156	836	526,432
Engines for:								
Motor trucks and buses	1,285	176,575	1,591	212,933	11,446	1,294,588	13,937	1,686,127
Passenger cars	1,626	132,732	877	96,497	11,169	995,184	14,473	1,376,357
Aircraft	314	3,122,721	195	1,468,531	2,008	17,704,362	807	5,632,171
Accessories and parts (carburetors)		486,733		278,357		2,348,948		1,385,355
IMPORTS								
Automobiles (dutiable)	57	48,673	53	29,590	302	319,894	256	183,322

Field Service—1940

As part of the camp set-up at Little Falls, Minn., where 85,000 U. S. Army troops conducted large-scale training maneuvers between Aug. 3 and Aug. 24, the Chevrolet Motor Division, through one of its dealers, the Bert Baston Motor Co., of Minneapolis and St. Cloud, Minn., established and operated a complete parts and service warehouse.

Three service representatives of the Baston company were on 24-hr. duty, on call at all times to repair and service 1180 pieces of Chevrolet transport equipment in use during the maneuvers. A stock of Chevrolet parts and accessories for repair or replacement with a total value in excess of $10,000 was maintained at the tent service headquarters.

committee, said that three types of plant facilities could be constructed under the plan: Plants built by the government and privately operated; privately built plants which have been assured government contracts; expansion of facilities by a manufacturer for the increased output of products he already makes and which the government requires.

The contractor could pay to the government the fair value of the facilities as determined by the appraisers and thereafter the government would have no interest in the facilities. The contractor would have the further option of purchasing the government's interest in the facilities, without appraisal, at their original cost less normal depreciation, the sum to be regarded as their fair value. In either case, if the government has not completely reimbursed the contractor for construction costs, the sum to be paid by the contractor would be reduced by the balance of the cost of construction. If the contractor does not wish to retain the facilities he could transfer them to the government, in which case alternatives would be available to the contractor and to the government. If the facilities are transferred to the government, the government would reimburse the contractor for the entire unpaid balance of his costs. In the event of termination, annual payments would continue until after settlement so that the contractor would not be embarrassed if he has obligations to meet out of such payments.

Fair value would be the value which the facilities have to the contractor without regard to their original cost and take into consideration only the prospective earning power which would add to the contractor's entire plant. Due allowance would be made for the expense which the contractor would incur if the facilities are to be adapted or converted to the contractor's peacetime activities. It is provided, however, that if the appraisers find that any removable facilities have a higher value in an open market sale than under the standard set up, such items may be valued at the open market value.

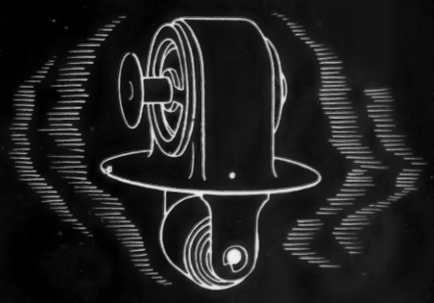
If the contractor is for any reason unwilling to purchase the government's interest or retain the facilities he may transfer them to the government. The government then would exercise certain options. In the case of separable or isolated facilities located on the contractor's land, the government would (1) remove such facilities or (2) purchase the land at a price determined by the arbitration plan mentioned.

Where part of the facilities are intermingled with the contractor's plant the government would (1) remove the

(*Turn to page 229, please*)

New Delco Plant At Anderson, Ind.

An aluminum foundry for the manufacture of aluminum castings for Allison airplane engines is under construction west of the No. 3 plant of the Delco-Remy division of General Motors at Anderson, Ind. Completion is scheduled for shortly after Jan. 1, 1941.



PRECISION BUILT TO MAINTAIN PREDETERMINED TEMPERATURE CONTROL

● Because automotive engineers constantly stake their reputation on equipment's ability to perform under a wide variety of road, load and weather conditions, they can make no compromise with precision.

It is significant that a large majority of leading automotive engineers depend on Dole Thermostats for precise pre-determined motor temperature control . . . and specify Dole Thermostatic Bi-Metal to assure accurate temperature response in devices of their own development.

Dole Double Port Poppet Type Thermostat . . . the leader in a line of star performers . . . positively eliminates sticking, binding and friction; it is balanced to control the circulation and temperature of water regardless of pump pressure.

Dole Thermostatic Bi-Metal . . . made to exacting specifications by time-tested precision procedures . . . are available in sheets, strips, coils, and fabricated parts ready for assembly.

Write or wire our engineering staff about your particular requirements.

DEPENDABLE DOLE FITTINGS—Range from compression couplings for all tubing connections to a complete assortment of water line end hose line parts for automobile hot water heaters.

THE DOLE VALVE COMPANY
1901-41 Carroll Avenue • Chicago, Illinois
Detroit Office: General Motors Building

DOLE
Thermostats
AND THERMOSTATIC BI-METALS

PUBLICATIONS

As an aid to choice of correct **lubricants for ball bearings,** New Departure, Division of General Motors Sales Corp., Bristol, Conn., offers a 15-page booklet covering the selection and application of both oils and greases.*

A booklet, issued by Bendix Products, Division of Bendix Aviation Corp., South Bend, Ind., covers the uses and origin of Bendix **cleaner for metal parts.***

"Acme Skid-Load Process" is the title of a booklet prepared by the Acme Steel Co., Chicago, covering methods and savings made on handling materials.*

"Localized Lighting" is the title of Catalog ML-25, which illustrates and describes various types of industrial lighting fixtures built by the Fostoria Pressed Steel Corp., Fostoria, Ohio.*

Z-Metal, product of the Ferrous Metals Corp., New York, is the subject of a booklet issued recently. Z-Metal is a ductile alloy cast-iron, the mechanical properties of which are said to be similar to those of certain worked steels.*

The Bound Brook Oil-Less Bearing Co., Bound Brook, N. J., has issued Stock List No. 1 on its "Compo" **porous bronze oil-retaining bearings.** Many sizes of bearings are tabulated and these data are supplemented by some information relative to permissible loads, shaft clearances and installations.*

Western Felt Works, Chicago, has prepared a wall card which displays various types of **synthetic rubber parts** which it manufactures.*

A new 24-page illustrated booklet describing the complete line of type SU **speed increasers** has been announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.*

Sparks-Withington Co., Jackson, Mich., has prepared an interesting booklet commemorating its fortieth anniversary.

The latest publication issued by the Farval Corp., Cleveland, is entitled **"Farval Dualine Jr. Centralized System of Lubrication."** Descriptions are supplemented by photographs and schematic drawings.*

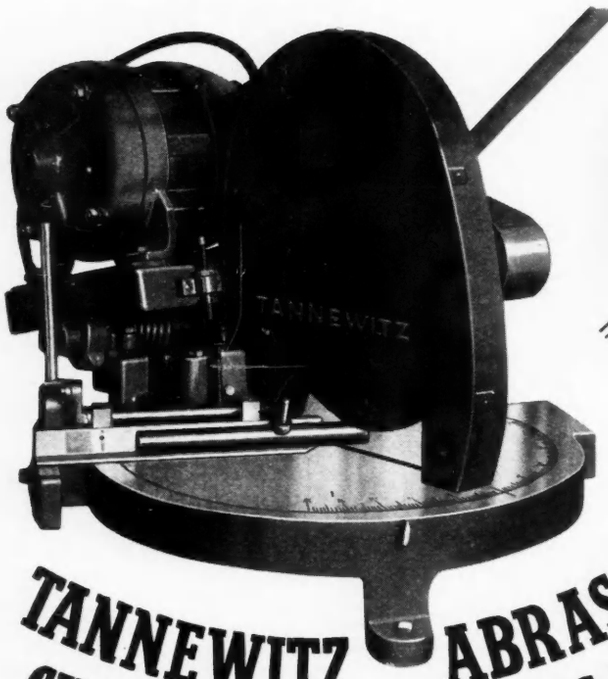
Ozalid Corp., Johnson City, New York, has brought out a four-page illustrated bulletin, No. 187, covering its new model "F" fast-printing **whiteprint machine.***

The Fostoria Pressed Steel Corp., Fostoria, Ohio, in July issued Vol. I, No. 1 of its new house organ, "Fostoria Flashes."

The Federal Alloy Block Co., Cincinnati, Ohio, has prepared a new catalog (Section "A" Catalog No. 40) covering its improved line of tackle blocks, snatch blocks and accessories for marine and industrial service.*

"Flame Hardening Apparatus," is the title of a new 12-page bulletin issued by the Air Reduction Co., New York, N. Y.*

*Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.



MODEL M
Bench
Model

TANNEWITZ ABRASIVE
CUT-OFF and MITERING MACHINES

A Faster, Better Means of Cutting Metal Bars, Tubing, Mouldings, etc.

7 SIZES
• Bench and Floor Models •
Wet or Dry Cutting

The machine shown above is the smallest member of the line; yet it is fully capable of cutting-off or mitering 1" x 16 gauge tubing in 2 to 4 seconds with a smoothness of cut that has the appearance of being ground. It is made with a swivel table and may be instantly set to cut at any angle from 45° left, to 45° right. Labor savings ranging from 75% to 90% are regularly accomplished with these machines over other methods of cutting metal bars, tubing, mouldings, etc. They pay for themselves in short order and step up production materially. A line requesting "ABRASIVE MACHINE" bulletin will give you the complete data on the seven machines in the line. Write NOW.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

New Purchasing Policy For Quartermaster Corps

Critical and essential items now are being purchased by the War Department's Quartermaster Corps on an f.o.b. mill and a "split bidding" basis. The change in policy was adopted, it was stated, in order that plants far removed from government depots could compete successfully with plants located near to the depots. The Quartermaster Corps has 10 field purchasing offices and confines its purchases to motor vehicles, machinery and supplies and other items classified as subsistance and clothing.

In response to inquiries on possible implications of the new policy under which supplies no longer will be bought on a delivered basis, it was said the policy is confined to the Quartermaster Corps. It was stated that any further change in purchasing policies which would affect products distributed under the basing point (delivered) system is unlikely. Officials of the National Defense Advisory Commission minimized the development as extremely limited in scope.

"Hereafter, bids on large orders may be invited on an f.o.b. factory or plant basis," said a statement released by the defense commission, whose information was based on an exchange of correspondence between the Quartermaster General and Donald M. Nelson, coordinator of defense purchases. "Awards

L. A. Bixby

. . . who has been named manager of automotive sales for the Clark Equipment Co., Buchanan, Mich. Mr. Bixby had served as manager of the Transmission Division of the company since 1934.

will be made to the lowest responsible bidders, disregarding cost of transportation from plant or factory to government destination. No reference will be made to possible destinations.

"In other words, the invitation will call for a certain quantity f.o.b. plant for shipments to any destination that the interest of the government may require. In all cases where the government is to furnish material, bidders will be informed that such material will be delivered to the plant or factory without expense to the contractor. Invitations will advise bidders that the earliest possible deliveries are required and the government reserves the right to give preference to early deliveries."

Defense Contracts

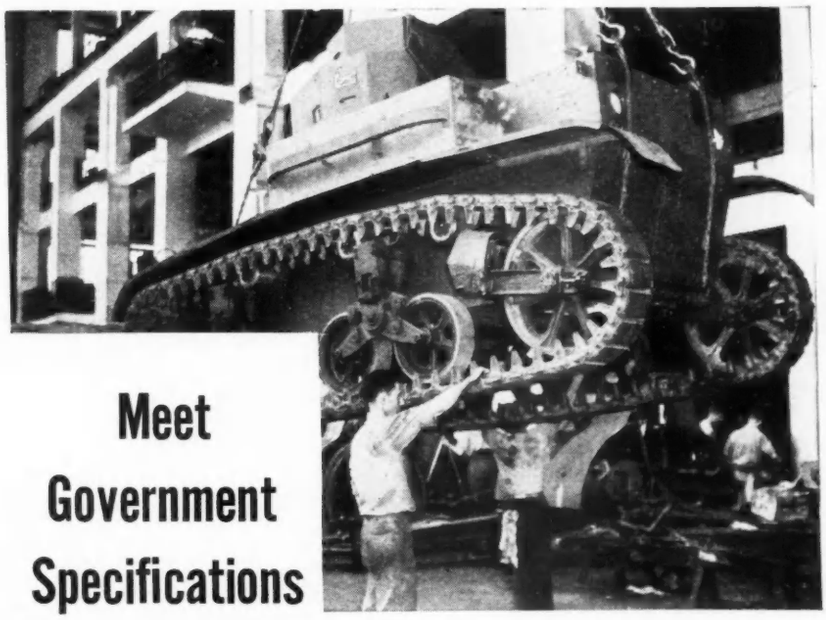
(*Continued from page* 227)

facilities, restoring the contractor's premises to their pre-contract condition; (2) purchase the contractor's interest in the entire plant at its appraised fair value which in no event would be less than the actual investment less ordinary depreciation, this plan to be used only if it is apparent to the contractor that the emergency facilities will contribute 50 per cent or more to the investment in the entire plant; or (3) the government would leave the whole or any part of the facilities in place.

This latter alternative would be adopted provided the facilities do not materially impede the contractor's operations under pre-contract conditions. If there is any disagreement regarding impeded operations the question would be submitted to arbitration. The contractor would have the right to use facilities left in place to the extent they replace other facilities and are necessary to enable pre-contract operating conditions. The contractor would care for such facilities as stand-by capacity but the government would pay all expenses, including accounting, maintenance, taxes and insurance, other than expenses incident to the use of the facilities by the contractor. Facilities left in place could be removed by the government at any time upon restoring the contractor's premises to their pre-contract conditions.

If new facilities are to be constructed for purposes of a supplies contract, and the contractor does not purport to seek reimbursement of cost through price, or protection against loss on construction in the event of the termination the contractor may nevertheless be required by the contracting officer to demonstrate that the price of the article does not include an extraordinary amount to reimburse the contractor for the cost of new facilities.

Mr. Biggers said the plan would tend to stop scrapping of plants after the emergency is at an end. The government, he said, should have an adequate reserve at all times. Donald M. Nelson, coordinator of defense purchases, explained that the plan would affect particularly munitions plants which would otherwise be abandoned or scrapped.



Meet Government Specifications with RYERSON CERTIFIED STEELS

When you're working on orders for defense, government steel specifications are no problem . . . if you buy *Certified* Steel from Ryerson!

Under the Ryerson Certified plan, you get steels made to narrow, close-range specifications. You get accurately identified steel of known analysis . . . steel you can depend on to meet government requirements. It is also easier to pass inspection on the finished job if Ryerson Certified Steel is used. All Ryerson Steels are closely controlled as to chemical content, accuracy and finish without the slightest increase in cost to you. A special quality control plan on Alloy Steels assures uniform heat treatment response.

And deliveries are no problem if Ryerson is your source. Enormous stocks . . . over 10,000 kinds, shapes and sizes . . . in ten conveniently located warehouses, are ready for immediate shipment. Practically every order is on its way the day we get it. Get acquainted now with this worry-free, superior Steel-Service, if you are not already a Ryerson customer. Stock List and any special information sent promptly on request.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON CERTIFIED STEELS

RYERSON

BOOKS . . .

A.S.T.M. STANDARDS, 1939. *Published by the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa.*

Publication work on the 1939 Book of A.S.T.M. Standards has recently been completed and copies are now available. Important changes are incorporated in this latest A.S.T.M. publication. For the first time, it contains all of the Society's specifications whether standard or tentative. Formerly the tentative specifications were issued in an annual volume, but the convenience of having these and the formally-adopted standards in one volume led to the present combination. The book is in three parts, instead of two parts as formerly, Part I covering Metals; Part II, Nonmetallic Materials — Constructional; Part III, Nonmetallic Materials—General; the divisions being as follows:

Part I, Metals—Ferrous and nonferrous metals, except methods of chemical analysis. General testing methods.

Part II, Nonmetallic Materials—Constructional — Cementitious materials, concrete, masonry building units, ceramics, pipe, timber and preservatives, paints, road materials, waterproofing materials, soils, general testing methods.

Part III. Nonmetallic Materials — General — Fuels, petroleum products, electrical insulating materials, rubber, textiles, soaps and detergents, paper, plastics, water, general testing methods, thermometers.

Each part contains a complete subject index, and there are three tables of contents. The first lists items under the general materials covered; following this is a table of contents giving a complete list of all of the items in the part in numerical sequence. The third table covers by subject the tentative standards, which appear in the back portion of each part. These tentative specifications are proposed standards in use throughout industry.

Practically all of the specifications and tests have been reset in the new double-column format. This use of new type gave all of the Society's committees an opportunity to review the items included and incorporate a number of editorial improvements.

The Society continues publication of its volume on Chemical Analysis of Metals, which describes 19 methods on 250 pages. The material in this book is of interest only to special groups, for which reason it was not included in the Book of Standards.

Institute Copyrights Grease Classification

The National Lubricating Grease Institute at its annual convention in Chicago in 1939 adopted a classification for lubricating greases which it has copyrighted. This classification gives the grade numbers and the A.S.T.M. worked penetration for each grade. The Institute states that while this classification is in no way a standard or specification of quality, it establishes the body or consistency of the grease and assures the manufacturers and consumers of lubricating greases of securing uniform bodies of consistencies while using this classification.

MEMA Reports Decline in All Branches in June

The regular monthly report of the Motor & Equipment Manufacturers Association issued in August (covering June, 1940, business) shows that shipments in all branches of the industry declined in June with the M.E.M.A. Grand Index dropping to 140 per cent of the January, 1925, base as compared with 157 per cent for May and 125 per cent for June, 1939.

Shipments to vehicle manufacturers for original equipment in June decreased to 139 per cent of the base, which compares with 162 per cent registered in May and 115 per cent for June last year.

Service parts shipments to whole-

• • • *Unequalled* SURFACE SMOOTHNESS and SPHERICITY

The series of lapping operations performed as a matter of course in the Strom plant give Strom Steel Balls a degree of surface smoothness and sphericity that has always been unequalled in any other regular grade of ball. Only through such unique lapping practice can extreme precision be obtained.

Physical soundness, correct hardness, size accuracy, and sphericity are guaranteed unconditionally in all Strom Balls.

Other types of balls—*stainless steel, monel, brass* and *bronze* — are also available in all standard sizes. Write for catalog and prices.

Strom STEEL BALL CO.
1850 So. 54th Avenue, Cicero, Ill.
The largest independent and exclusive Metal Ball Manufacturer

"These are business men.."

Testifying before a sub-committee to the Senate Appropriations Committee in connection with a request that restrictions on profits for aircraft and ship construction in the Act of 1940 be removed and that the pending excess profits tax-amortization legislation be expedited, Brig. Gen. George H. Brett, chief of the Materiel Division, said:

"Now, my experience over the past year and a half with the (aircraft) industry indicates that these are business men; they have a board of governors just like any other concern. They have their plants filled right up to the limit. I could cite two or three contractors who, as I say, have put up $500,000 to $750,000, on the barrel head, buying material and equipment, for which they do not even have an order, in an endeavor to meet our desires in connection with the national defense, and therefore, I could have had seven of these contracts signed on the moment that the bill (limiting profits) was passed on July 2, had it not been for the uncertainties introduced to which reference has already been made.

"Now, they have played ball during my experience of a year and a half as chief of the division, and my knowledge of the operations going on in the division prior to my taking over this job. The industry has always played ball with the government, and they have lost money in doing it at times."

salers for June declined to 165 per cent of the base as compared to 172 per cent in May. In June, 1939, the index stood at 166 per cent.

Accessories shipments to wholesalers in June dropped, standing at 86 per cent of the base index, which compares with 89 per cent in May and 113 per cent in June, 1939.

Service equipment shipments to wholesalers in June declined to 117 per cent of the base, which compares with 131 per cent in May and 108 per cent in June, 1939.

ADVERTISING

Frank A. Johns has been appointed advertising manager of the Federal Motor Truck Co., Detroit, to succeed Stanley G. Mitchell, resigned.

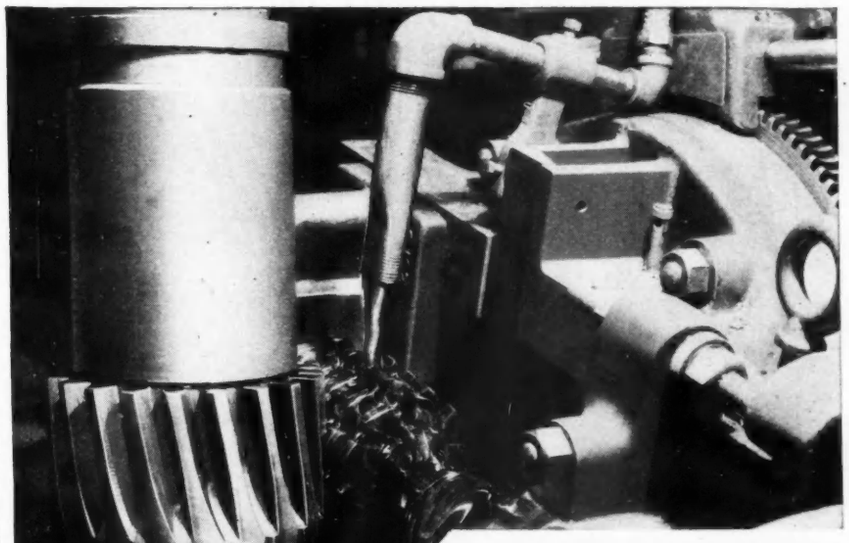
Theodore F. MacManus has been appointed advertising counsel to Willys-Overland Motors, Inc. Joseph W. Frazer, president and general manager of the Willys, made the announcement in a joint statement with Ward M. Canaday, president of United States Advertising Corp. which is servicing the Willys account.

Edward F. Korbel and Worth Colwell, who direct the publicity for the National Automobile Show, have been appointed to direct the public relations campaign for the National Aeronautics Council, 37 West 47th St., New York, N. Y.

Despite the interest displayed by several automotive accounts in the "Information Please" program, Clifton Fadiman and his board of experts will promote Lucky Strike cigarettes beginning in November, Lord & Thomas is the cigarette agency.

Robert K. Edmonds has joined MacManus, John & Adams, Inc., and will be a member of the Pontiac Motor Division group on copy and contact.

20th Century Aircraft, Inc., Los Angeles, has named Darwin H. Clark Advertising Agency to handle its advertising. The new aircraft concern, headed by William Schoenfeldt, Roscoe Turner, and Keith Rider, was formed to build military pursuit ships of plastic construction.



HOBBING GEARS TO MEET TOUGH SPECIFICATIONS . .

HOBBING gears of extreme hardness (325—350 Brinell) as used in oil well pumping reducers—for particularly arduous duty—was the problem of a Chicago manufacturer. In cutting and maintaining this unusual hardness and maintaining high accuracy, Cities Service oils were used as the cutting lubricant.

No doubt you have one or two like problems in your shop. Why not find out what our lubrication engineers can do for you in your own shop with the right metal cutting lubricant? Just write us to have a lubrication engineer call.

Copies of our booklet on "Metal Cutting Lubrication" are available to users of metal cutting lubricants. Write for your copy today, before the supply is exhausted.

CITIES SERVICE
Cutting Oils
"SERVICE PROVED"

CITIES SERVICE OIL COMPANY,
Sixty Wall Tower, Room 1626F, New York

Please send me information concerning your Lubrication Engineers' Service ☐

Please send me booklet on Metal Cutting Lubrication ☐

Name.....Title.....

Business Address.....

Firm Name.....

City.....State.....

American Standard For Twist Drills

The American Standards Association has announced completion of an American Standard for Twist Drills. The standard consists of three main parts: 1. nomenclature and classification of drills; 2. a table of 116 American Standard drill diameters ranging from 0.0156 to 0.5000 in., inclusive, with corresponding over-all and flute lengths; and, 3. an Appendix giving the American Standard series and the "Manufactured Sizes" still available from the shelves of the twist drill manufacturers but not specified in the American Standard recommended series.

The American Standard for twist Drills was developed by the following committee: W. C. Mueller, chairman, Western Electric Co.; W. L. Barth, General Motors Corp.; C. R. Briney, Jig Bushing Co.; G. L. Buffington, Ex-Cell-O Corp.; J. H. Horigan, Union Twist Drill Co.; C. W. Spicer, Spicer Mfg. Corp.; and F. S. Walters, Westinghouse Electric & Mfg. Co. The Society of Automotive Engineers, the American Society of Mechanical Engineers, and the National Machine Tool Builders Association cooperated with the ASA in developing the standard.

Things are Humming!
BUZZ-Z-Z
WE'RE busier than a couple of hives of bees but we want you to know one thing: regardless of the pressure brought about by the increased volume of rush orders for Accurate, we refuse to allow any let-down in the accuracy or quality of Accurate Springs. The activities of the engineering and inspection departments have been intensified to insure this. In other words, we insist upon "making haste slowly", jealously guarding the reputation of Accurate products. Your production schedules have probably been stepped up. You need more than ever this assurance of quality and precision from your sources of supply. Be sure you get it.
SPRING HANDBOOK Full of usable spring data. Yours for the asking!
Accurate Springs
ACCURATE SPRING MFG. CO. 3811 W. Lake St., Chicago

Edwin J. Thomas

. . . who has advanced from the executive vice-presidency to the presidency of the Goodyear Tire & Rubber Co. P. W. Litchfield will divest himself of the title of president on Sept. 1, retaining the chairmanship of the board.

CALENDAR

Conventions and Meetings

National Industrial Advertisers Association, Annual Meeting, Detroit, Sept. 18-20
SAE National Tractor Meeting, Milwaukee .....Sept. 24-25
SAE Annual Dinner, New York.....Oct. 14
American Society for Metals, Annual Meeting, Cleveland, Ohio.....Oct. 21-25
American Welding Society, Annual Meeting, Cleveland .....Oct. 20-25
SAE Nat'l Aircraft Production Meeting, Los Angeles .....Oct. 31-Nov. 2
Aeronautical Chamber of Commerce of America, Inc., Annual Meeting, New York .....Dec. 5
National Association of Manufacturers, Annual Meeting, New York....Dec. 9-13
SAE Annual Meeting, Detroit, Jan. 6-10, 1941
National Automobile Dealers Association, Convention, Pittsburgh, Pa. Jan. 20-23, 1941

Shows at Home and Abroad

Detroit Automobile Show .....Oct. 12-19
National Automobile Show, Grand Central Palace, New York.....Oct. 12-20
Pittsburgh Automobile Show.....Oct. 19-26
National Metal Congress & Exposition, Cleveland, O. .....Oct. 21-25
Chicago Automobile Show....Oct. 26-Nov. 3
Automotive Service Industries Show, Chicago .....Dec. 9-14
Machine & Tool Progress Exhibition, Detroit .....Mar. 24-29, 1941

Harry M. Rugg

Harry M. Rugg, automotive engineer for the Pennsylvania Grade Crude Oil Association, suffered fatal injuries recently in an automobile accident near Pennfield, Pa.

Studebaker Makes 1941 Bow

(*Continued from page* 216)

Cruiser. Both body styles are available in regular and deluxe-tone editions. In both the Commander and President sedans the total glass area has been increased 168¾ sq. in. Front-seat hip room has been increased 2½ in., to 57½ in., rear-seat hip room to 49¾ in. Front-door windows are of the ventilating swing type, with a locking grip that may be lowered entirely. The rear window is one piece of tempered glass. Doors are weather-stripped all around.

As in the case of the Champion, the interiors of Commanders and Presidents are decorated, upholstered and trimmed to match or blend with the exterior colors. Broadcloth upholstery is used in deluxe-tone models of both lines. Harmonizing colors of three kinds of cloth are standard, and leather is used for artistic effect in the seat bolsters. This leather comes in contrasting shades of the cloth upholstery and helps to harmonize the interior trim with the exterior colors and design. The trunks on both models are larger this year, having 20.1 cu. ft. capacity.

Commanders and Presidents are built to accommodate the Climatizer system, in which an improvement has been made. Last year fresh air was taken in through ports alongside the left running board. This year the fresh air enters through a ventilating screened door at the left of the body just ahead of the front door. The air is conducted to the Climatizer under the front seat through a duct in the body. In the Climatizer it is filtered and heated, and it is then distributed to front and rear compartments.

Industry to the Front

(*Continued from page* 190)

In his address to the annual meeting of the A.M.A., President Alvan Macauley pointed out, "If this nation is to be able to bear the taxes that will be required to pay for the necessary defense program, normal production for sale to the domestic market must go forward at the largest possible rate. While we contribute what is needed to equip our defense establishment, we can do most to maintain the strength of this country by keeping up our normal business."

Harlow H. Curtice, president of the Buick Division of General Motors, voiced the same opinion when he said that any arms production would be collateral with Buick passenger car output, as it is the industry's duty to maintain normal operations and employment in addition to its share of the preparedness program.

Robert F. Black, chairman of the Motor Truck Committee of the A.M.A., expressed the belief that the national defense program will not disrupt the vital needs of shippers and consumers in getting transportation service. The U. S. must produce 2,388,000 motor cars and trucks every year just to maintain existing rolling stock.

In accepting the order for Rolls-Royce aircraft motors, Max Gilman, president of Packard Motor Car Co., emphasized that this order would have no effect upon Packard's normal motor car output.

Thus the motor car industry stands ready to do its share in preparing the nation for any eventualities, meanwhile pursuing its normal peace time production so that the United States can travel on wheels in speed and comfort.

Pratt & Whitney Expanding Engine Testing Facilities

Pratt & Whitney Aircraft in East Hartford, Conn., has announced that contracts for the construction of two new aircraft engines test houses have been awarded to the Turner Construction Co. The buildings were designed by Albert Kahn, Inc., and will supplement a battery of 32 smaller production test houses that are now in almost continuous operation. Construction has already begun and is expected to be finished by Oct. 1.

dag
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COLLOIDAL GRAPHITE
SURVIVES FIRE . . .
. . . without losing its lubricating properties even at temperatures of 1800°F and upwards in ceramic and glass making machines; in conveyors and baking ovens, in die casting and permanent mold equipment.
"Dag" outlasts temperatures that burn petroleum oil, thus lubricants can be prepared by dispersing this product in fluids that quickly evaporate at the higher temperatures. Only a positive, clean lubricating film of pure "dag" colloidal graphite is left which becomes affixed to the bearing surfaces. "Dag" makes an ideal teammate for oil, as it takes over the load at the point beyond which plain lubricants fail.
A note on your letterhead will bring a production sample and Technical Bulletin 130 which tells how to use "dag" for high temperatures . . . you or your oil supplier can easily add "dag" to your present lube or to specially selected petroleum fluids.
ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN
dag
COLLOIDAL PRODUCTS

MEN AND MACHINES

(*Continued from page* 211)

burner feature is said to assure close uniform control over the furnace atmosphere, as compared with the conventional multiple burner system of the side firing furnace.

Aluminum Ladder Co., Tarentum, Pa.—Double or "A" type aluminum ladders constructed with steps on both sides. Model No. 900 is 36 in. high, has a platform, 12 in. by 15 in., and weighs only 13 lb.

Alexander Milburn Co., Baltimore, Md.—Type FF "Twin Stage" regulator. This model may be adjusted to various pressures. After the selected pressure is set, the delivery stage may be adjusted to any desired working pressure up to 200 lb., or more, if specified. First stage of Type FF can be attached to practically any make of single stage regulator, converting it to two-stage control.

Linde Air Products Co., Unit of Union Carbide & Carbon Corp., New York, N. Y.—A new liquid flux and its dispenser, for use in bronze-welding ferrous and non-ferrous materials.

Farval Corp., Cleveland—A "Junior" unit which operates on the same piston displacement principle of measurement employed in the large Dualine systems of centralized lubrication on heavy machines.

Skilsaw, Inc., Chicago.—Three new model disk sanders: "SP," a two-speed heavy duty sander and polisher which operates at 4200 r.p.m. or 1300 r.p.m. and uses a 7-in. disk; "H2," a two-speed heavy duty sander which uses a 9-in. disk at 2700 r.p.m., and a 7-in. disk at 4200 r.p.m.; "SL," an extra heavy power unit that operates at a no-load speed of 5000 r.p.m. with 6-in. wheel.

Lake Erie Engineering Corp., Buffalo, N. Y.—150-ton hydraulic press with 108-in. daylight and 76-in. stroke.

Knu-Vise, Inc., Detroit — Knu-Kam-Klamp made in two sizes, both interchangeable with this company's standard type No. 110 and No. 250 toggle clamps. These clamps now have a wider field of application inasmuch as they do not have the disadvantage inherent in a standard toggle clamp which allows only one thickness of stock to be clamped at one set-up.

Harris Calorific Co., Cleveland—Improved model "K" portable, motor-driven gas cutting machine for cutting steel of light or heavy section. It will cut straight lines of any length, with square or beveled edges; 1-in. to 86-in. diameter circles. The speed range is listed as 3 in. to 60 in. per min., forward or reverse. Machine, complete with torch, weighs 45 lb.—H.E.B., Jr.

LET A WELLS SAW

Put TEETH IN YOUR PRODUCTION SCHEDULE

Built in Two Sizes:

No. 5—	No. 8—
5" diameter round or 5"x10" flat	8" diameter round or 8"x16" flat

Also, the new No. 9 Upright Saw, a recent addition to the Wells line.

THOSE plans you've probably made for stepping up production —put teeth in them—carry them out according to schedule. A Wells Metal Cutting Band Saw can help you do it. The Wells Saw is one of the handiest all-around tools a plant can have for continuous production on the dozens of odd jobs—cuts bars, angles, tubes, plates—fast, accurate, portable and dependable. It puts *its* teeth in metal and bites through in a hurry—helps in a hundred ways to keep things humming. Write for details NOW.

WELLS MANUFACTURING CORP.
THREE RIVERS • MICHIGAN

WELLS METAL CUTTING BAND SAWS

Machine Tool Plants Operated At 88.3% Capacity in July

The machine tool industry's operating rate in July, according to the capacity index prepared by the National Machine Tool Builders' Association, stood at 88.3 per cent. An earlier report showed 92.3 per cent for June, 1940.

Publications Available on Machine Tools.

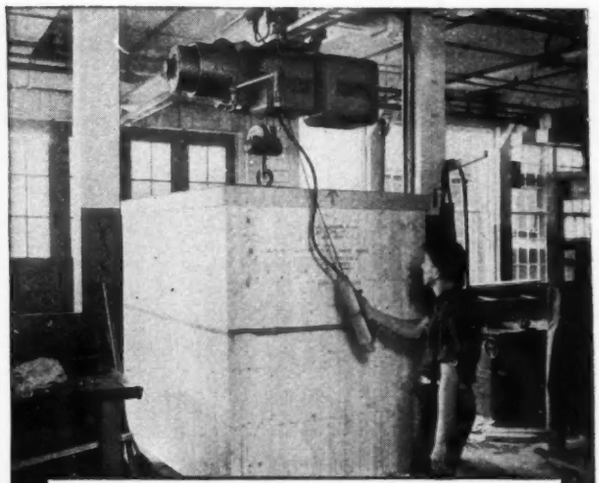
Metallizing Engineering Co., Inc., Long Island City, New York, has brought out the first issue of "Metco News," a periodical devoted entirely to the latest developments and applications of the **metal spraying** process.*

The Lithium Corp., New York, N. Y., has published a leaflet describing its Lithco **atmosphere furnaces.***

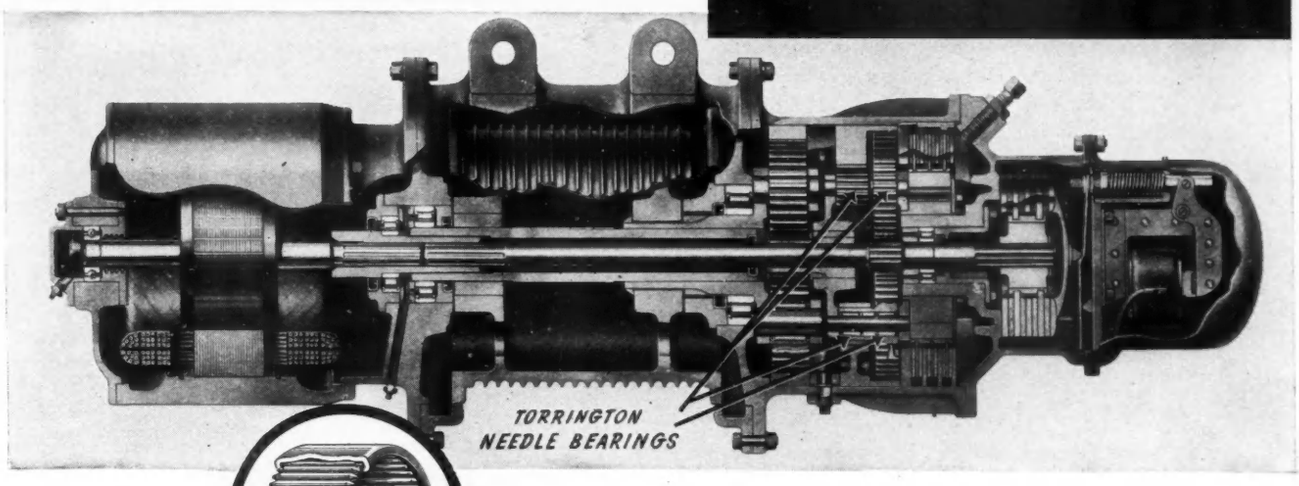
"The Welding of Republic Enduro Stainless Steel" is the title of a 20-page booklet issued by the Republic Steel Corp., Cleveland. It contains data on the welding of stainless steel by various commercial methods, including electric arc, atomic hydrogen, flash, projection, seam, spot and gas. Brazing and silver soldering also are discussed.*

(*Turn to page* 236, *please*)

SHEPARD NILES *LIFT ABOUT* HOIST adopts TORRINGTON NEEDLE BEARINGS on ALL counts



The "Lift-About" Hoist on the job. High radial load capacity —provided by many linear inches of contact—makes the Needle Bearing ideal for hoisting service applications.



Cross-section showing how Torrington Needle Bearings are mounted in gear train assembly.

"For our Shepard Niles Electric Hoists," say the Company's engineers, "Torrington Needle Bearings were selected because of their small size, high load carrying capacity, ease of installation and low cost." So, like many other manufacturers, Shepard Niles Crane & Hoist Corporation found in Torrington Needle Bearings exactly the features they required.

Perhaps you, too, can incorporate the many advantages of this unique bearing in *your* product. Consider these features:

SMALL SIZE: Because the Torrington Needle Bearing is small radially and long axially, it requires only the simplest type of housing structure—no more space than a simple bushing.

HIGH LOAD CAPACITY: The Needle Bearing's full complement of small diameter needles gives many inches of linear contact, resulting in high radial load capacity.

EASY INSTALLATION: The design of the bearing—long axis and small diameter—permits the use of an extremely simple form of bore housing. And being a single unit, the bearing can be pressed into position with an ordinary arbor press.

EASE OF LUBRICATION: Lubrication is extremely simple, efficient and thorough. The turned-in lips of the retaining race form a natural reservoir for grease or oil—holding ample quantities for long periods of operation without renewal.

LOW COST: Because of its simple design, the Torrington Needle Bearing, compared to other types of anti-friction bearings, is surprisingly low in cost.

All these factors become tangible values in the cost accounting of the production line. And perhaps only a minor change in the design of your product will enable you to take advantage of these important cost savings. Further information is given in our Catalog No. 7 which will be sent on request. For Needle Bearings to be used in heavier service, ask for Booklet 103X from our associate, Bantam Bearings Corporation, South Bend, Ind.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.
Makers of Needle and Ball Bearings

New York Boston Philadelphia Detroit
Cleveland Chicago London, England

TORRINGTON
NEEDLE BEARING

(*Continued from page* 234)

Metal cutting saws made by the Peerless Machine Co., Racine, Wis., are described in this company's latest bulletin, No. 51.*

Industrial gas masks made by the Mine Safety Appliances Co., Pittsburgh, Pa., are described in bulletin No. ED-7.*

Catalog No. M-865, published by Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio, describes the company's new vertical "Hydro-Tel" **milling machine.***

An attractive bulletin has been prepared by the **Hardinge Brothers, Inc.,** Elmira, N. Y., in celebration of its Golden Anniversary.*

Bulletin No. 53, issued by the Hannifin Mfg. Co., Chicago, describes a wide range of **"hy-power" hydraulic equipment** for riveting, punching, pressing and similar operations.*

A new six-page folder describing how **Kennametal** is manufactured has been issued by McKenna Metals Co., Latrobe, Pa. It is entitled "Cut Steel Profitably with Kennametal Tools and Blanks."*

Volume 186 of its Labor Saver magazine has been published by **Stephens-Adamson Mfg. Co.,** Aurora, Ill., manufacturer of conveying, material handling and screening machinery.*

Norton Co., Worcester, Mass., has published a booklet entitled "Norton Metal Bonded Diamond Wheels." It is the company's first booklet which discusses thoroughly the uses and application of the Norton **metal bonded diamond wheel.***

Two "Blue Sheets," covering wire products and electrical materials, have been issued by the **Allegheny Ludlum Steel Corp.,** Pittsburgh, Pa.

A new bulletin on **carbide tool grinders** has been prepared by the Ex-Cell-O Corp., Detroit.

Republic Steel Corp., Cleveland, has released a handy four-page, letterhead size folder which contains a table listing the analyses and properties of 13 types of Enduro **stainless steel.** For comparison purposes, identical data for a carbon steel, SAE 1020, are listed.*

*Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

Correction

In the Aug. 15 issue of AUTOMOTIVE INDUSTRIES, identifications for illustrations of the Stokes molding press and the Acme welder which appeared on pages 185 and 186 were transposed.

● For 37 years, Spicer has been foremost in automotive experimenting and testing, in developing efficient equipment designs, in engineering for performance, in building to standards that result in exceptional service. • Spicer cooperation with the car and truck industry, resulting in improved power transmission and performance, have won the confidence of every automotive manufacturer. Specify Spicer!

New Body Styling on Hudsons

(*Continued from page* 213)

tor ornament and identifying Hudson crest.

Parking lights on the sides of the bonnet, have been redesigned and doubled in size. In the new Hudson Six they are rectangular in design; in all others, beginning with the Super Six, they are shaped to suggest the familiar Hudson triangle when illuminated. In the new Commodore Eight models these bonnet lights are supplemented by ornamental fender lamps incorporated in a chrome moulding mounted above the Sealed Beam Headlights. In Commodore Custom models, directional safety signals are incorporated in the fender lamps. Both fender lamps and directional signals are available as extra cost options in other models. A new type of moisture sealing gives additional protection to the contents of the luggage compartment. The deck lid handle is incorporated in the fixture which holds the license plate light and locks with a clamping action which prevents weaving.

Three basic color harmonies are used in the 1941 interiors. One of these interiors is carried out in tones of gray, another in tan, and a third in green. Color harmonies in gray and tan are standard in the Hudson Six, while all other models, beginning with the Super-Six, have all three—the one included in any car being determined by the exterior color.

Fitments include twin ashtrays inset in the deeply upholstered rear seat armrests, assist cords and tapestry carpet with recessed carpeted footrests. Front dome lights are standard in all models and Commodore Series Sedans include an additional rear dome light. All models have draft-free ventilation. Both the Hudson Six and the Hudson Super-Six have a new 17-in. two-spoke steering wheel.

Airfoam Seat Cushions are standard beginning with the Commodore Six. An effective style innovation is introduced by paneling front and rear seat backs and armrests in a harmonizing shade of genuine leather.